TECHNICAL PROCUREMENT SPECIFICATION	CD-110SS-11kV-SB-CP	
	PAGE 1 OF 1	R1

TPS No.	CD-110SS-11kV-SB
STATUS	■ ENQUIRY ☐ COMMITMENT
ORIGINATING DEPT.	ELECTRICAL
P.O / W.O NO.	
PROJECT	SUPPLY OF 11kV, 1250A, 40kA SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS
ITEM	11kV, 1250A, 40kA SWITCHBOARD
LOCATION	110kV SUBSTATION – FACT-CD
CLIENT	M/S. FACT - CD
PURCHASER	M/S. FACT - CD
VENDOR	

REV NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
R1	07.01.2022	REV1	DVS	KPN	BKN
R0	15.10.2021	REV0	DVS	KPN	BKN

FACT - COCHIN DIVISION

TECHNICAL PROCUREMENT SPECIFICATION	ATTACHMENTS	CD-110SS-11kV--ATT	
		Page 1 of 1	R1

SL No	Tag	Description	No. of Pages	Rev. No. with Issue			
				1	2	3	4
1	CD-110SS-11kV- IS	Equipment/ Items to be supplied	1	0			
2	CD-110SS-11kV-SW	Scope of Work	1	0			
3	CD-110SS-11kV-INS	Scope of Inspection and Tests	2	0			
4	CD-110SS-11kV-VDSP	Vendor Data Submission Procedure	3	0			
5	CD-110SS-11kV-VDI	Vendor Data Index	1	0			
6	CD-110SS-11kV-VDR	Vendor Data Requirements (VDR)	2	0			
7	13ES900/94/R1	Engg Specification – General Requirements for Electrics	4	0			
8	CD-110SS-11kV-DA	Data sheet – General Requirements for Electrics	1	0			
9	13ES903/94/R1	Engg Specification – HV Switchboard	15	0			
10	CD-110SS-11kV-DS	Data sheet – HVSB (11kV) THERMAL	6	0			
11	CD-110SS-11kV-TPSV	Technical Particulars – High Voltage Switchboard (11 KV)	5	0			
12	CD-110SS-11kV--SPL	Spares List	1	0			
13	CD-110SS-11kV--SV	Sub vendor list	1	0			
14	CD-110SS-11kV-CS	Compliance statement	1	0			
15	CD-110SS-11kV-PB	Price format	1	0			
18	CD-110SS-11kV-TCL	Technical checklist	12	0			
	DRAWINGS						
1	CD-ELE-110KVSS-11kVSB	Single Line Diagram of 11kV switchboard at 110 kV Substation	1	0			

REV. NO.	DATE	DESCRIPTION	PRPD	CHKD	APPRD
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	EQUIPMENT/ ITEMS TO BE SUPPLIED	CD-110SS-11kV-IS	
		Page 1 of 1	**R1**

TPS NO. CD-110SS-11kV-SB

Sl. No.	Eqpt. No./ Tag No.	Description	Qty.	Remarks
1.0		Design, engineering, manufacturing, testing at works and supply of 11kV, 1250A, 40kA Vacuum Circuit Breaker switchboard for 110kV substation conforming to attached specifications/documents.	1 No.	Including 2 no.s cable earthing truck.
2.0		Supply of spares as per “Spares List” attached.	1 set	

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REV.	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

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TECHNICAL PROCUREMENT SPECIFICATION	**SCOPE OF WORK**	CD-110SS-11kV-SW	
		Page 1 of 1	**R1**

TPS NO: **CD-110SS-11kV-SB**

ITEM: **11kV, 1250A, 40kA SWITCHBOARD**

EQPT. NO.:

The Scope of work include the following

Sl.No.	Description	Required	Remarks
1.0	Design, engineering, manufacturing, testing at works and supply of the following high voltage switchboard fully conforming to the attached specifications and documents		
1.1	11kV, 1250A, 40kA Vacuum circuit breaker switchboard for 110kV substation	YES	With 2 no.s cable earthing truck.
2.0	Arranging inspection and tests as per “Scope of Inspection & Tests” attached.	YES	
3.0	Supply of spares as per “Spares List” attached.	YES	
4.0	Furnishing all data/documents as per VDR attached.	YES	Including relay setting/co-ordination details of numerical/protection relays.
5.0	Commissioning of switch board (Erection of switch board shall be arranged by purchaser through a separate contract).	YES	Including programming, setting, etc. of numerical relays.

REV. NO.	DATE	DESCRIPTION	PRPD	CHKD	APPRD
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TPS NO: CD-110SS-11kV-SB

ITEM: 11kV, 1250A, 40kA SWITCHBOARD

EQPT. NO.:

The following inspection and test shall be conducted and records/reports to be submitted

Sl. No.	Description	Ins./test Reqd.	Witness Reqd.	Remarks
1.0	**Physical verification** for compliance with P.O. specifications, scope of work, approved drawings, BOM etc	Reqd	Reqd	
2.0	**Routine tests**			
2.1	Power frequency voltage dry tests on main circuits.	Reqd	Reqd	
2.2	Voltage tests on control and auxiliary circuits.	Reqd	Reqd	
2.3	Measurement of resistance of the main circuits.	Reqd	Reqd	
2.4	Mechanical operation tests	Reqd	Reqd	
2.5	Tests of the auxiliary electrical devices	Reqd	Reqd	
2.6	Verification of wiring	Reqd	Reqd	
2.7	Electrical operation test	Reqd	Reqd	
2.8	Megger test	Reqd	Reqd	
2.9	Safety interlocks and protection against electric shock and short circuits.	Reqd	Reqd	
2.10	Verification of nameplate information & marking	Reqd	Reqd	
2.11	Separate testing of operating mechanism and other accessories	Reqd		Test reports to be furnished
2.12	Primary and secondary injection tests on panels and protective gears	Reqd		Test reports to be furnished
2.13	High voltage tests on panels and protective gear	Reqd	Reqd	
2.14	Proper functioning of mechanical and electrical interlocks.	Reqd	Reqd	
2.15	Interchangeability of drawout breakers of the same rating.	Reqd	Reqd	
2.16	Checking of mechanical work like surface finish, movement and proper engagement of withdrawable breakers, fixing of doors, etc.	Reqd	Reqd	
2.17	Verification of CT ratio and polarity of CTs.	Reqd	Reqd	Test reports to be furnished

2.18	Checking of protective earthing circuits	Reqd	Reqd		
3.0	**Copy of type test certificates/reports of the following tests conducted on representative functional unit to be furnished.**				
3.1	Impulse voltage dry test				
3.2	Power frequency voltage dry tests				
3.3	Temperature rise tests				
3.4	Verification of dielectric properties				
3.5	Verification of making and breaking capacity				
3.6	Verification of temperature limits and characteristics of relays				
3.7	Short time current tests on main circuits				
3.8	Short time current test on earthing circuits				
3.9	Mechanical operation test				
3.10	Verification of degree of protection				
3.11	Type test report of offered breaking capacity panel				
3.12	Capacitor switching test				

3					
2					
1	07.01.2022	REV1	DVS	KPN	BKN
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FACT CD					

1.0.0. SCOPE

1.1.0. This document together with "VENDOR DATA REQUIREMENTS (VDR)" defines FACT's requirements for vendor drawing and data for any enquiry, work order or purchase order.

1.2.0. Bidders unable to comply with these requirements must detail all exceptions in their proposal. The timely delivery of quality drawings and data is as crucial as delivery of the equipment itself and hence the same shall be strictly adhered to after commitment.

1.3.0. Failure to provide adequate preliminary data / drawing may render a proposal non-responsive and hence may be rejected. After commitment failure to provide documents as per purchase order may delay progressive payments and adversely affect future invitation to bids.

2.0.0. VENDOR DATA REQUIREMENTS (VDR)

2.1.0. FACT will provide a partially completed VDR form along with each enquiry. This form explains group code of the document, quantity of each document required and lead time for submission. Columns are available for the vendor to fill in his deviations, if any, from FACT's requirements.

2.2.0. The vendor shall forward a filled-in VDR form along with his offer, if he has got any deviation from FACT's requirements. In the absence of a filled-in VDR form along with the offer, it will be presumed that the vendor is accepting FACT's requirements specified in the VDR.

3.0.0. CLASSIFICATION OF DOCUMENTS

3.1.0. Documents are classified based on their status and nature of content.

3.1.1. Status of documents:

1. Preliminary documents required along with the offer.
2. Documents to be submitted after commitment.
3. Final documents.

3.2.0. The documents are further classified into Groups A, B and C, depending on the nature of the documents as explained below.

3.2.1. Group A requirements

These documents are urgent in nature and contain information that are required for proceeding with the detailed engineering of surrounding/down stream equipments in the plant and hence are to be submitted on priority basis.

3.2.2. Group B requirements

These documents are to be reviewed by FACT for compliance with the purchase order / work order specifications but are not essential for other engineering activities of FACT.

3.2.3. Group C requirements

Documents in this group contains data / information / records which are final in nature and that are required for the equipment user and need not be reviewed by FACT.

4.0.0. VENDOR DATA INDEX (VDI)

4.1.0. Vendor shall forward a filled up and updated VDI along with each vendor data transmittal. VDI shall list out all documents that are being prepared for the particular order, their current revision status and indicate the documents included in the present transmittal. A blank VDI is attached along with this document which shall be used for this purpose.

5.0.0. QUALITY OF VENDOR DRAWINGS

5.1.0. Vendor drawing and data shall be supplied in full size drawings, reproducibles and CDs as specified in the VDR.

5.2.0. All drawings / documents shall be clear, legible, right reading and made out of originals prepared in black ink. English language and metric units shall be used for the preparation of all documents.

5.3.0. The documents shall be prepared in any of the following standard sizes.

5.3.1. A1: 594 mm x 840 mm
5.3.2. A2: 420 mm x 594 mm
5.3.3. A3: 297 mm x 420 mm
5.3.4. A4; 210 mm x 297 mm

5.4.0. All documents submitted to FACT shall be folded into A4 size (210 x 297 mm) except originals/ reproducibles which may be rolled. Soft copies shall be furnished for final drawings/documents.
5.5.0. Each drawing / document shall have a title block at the right hand bottom corner with the following information.
5.5.1. Name of Vendor.
5.5.2. Name of Project, Owner and location
5.5.3. FACT Purchase Order Number.
5.5.4. Equipment name and number.
5.5.5. Drawing title.
5.5.6. Drawing number, revision and page number.

5.6.0. All drawings shall be drawn to some standard scales only and the same shall be indicated in the drawing.
5.7.0. The status of the document like "PRELIMINARY, FINAL, FOR REVIEW" etc. shall be stamped on all copies forwarded to FACT.
5.8.0. All documents shall have a block of 100 mm x 100 mm space left vacant for FACT to put their stamp after review.
5.9.0. All drawing/document shall have a revision block explaining revision number, revision description, data of revision, revision authorization etc. When the revised drawings are submitted all currently revised area shall be clearly demarcated by clouding. Any revisions made on other parts of the documenting will not be reviewed by FACT.
5.10.0. When drawings are received back from FACT with comments, vendor shall incorporate all the comments and resubmit the same. If the vendor is not in a position to incorporate certain comment made by FACT, then the reason for such deviation shall be highlighted in the forwarding letter to FACT.

5.11.0 The respective engineering specification and other purchase order spec. will explain the minimum data / details required in various drawings. In the absence of any such information in the purchase order documents, vendor shall follow the standard good engineering practices in detailing the drawing.

6.0.0. CONDITIONS OF FACT REVIEW

6.1.0. FACT reserves the right to review the vendor documents. FACT's REVIEW WITH OR WITHOUT COMMENTS OF THE VENDOR DOCUMENTS SHALL NOT RELIEVE THE VENDOR OF RESPONSIBILITY TO COMPLY WITH ALL PURCHASE ORDER TERMS AND CONDITIONS, including all implied requirements relating to fitness for service and good engineering practices. Approval or acceptance does not imply or infer any determination relating to compliance by the vendor with its full responsibilities under the purchase order.

6.2.0. FACT's comments are limited to identifying requirements within the scope of the purchase order or failure by the vendor to comply with the requirements of purchase order, as revealed by the limited review. Oversights in the above limited review cannot be taken as approval for the vendor to deviate from the purchase order conditions. FACT reserves the right to point out any such deviations at any stage of the order execution. The vendor shall comply with all such requirements without any price / delivery implications.

6.3.0. FACT review will be authorized by an official stamp as given below, properly filled and signed by the concerned. Comments if any will be indicated in red ink or clouded in the case of copies of commented drawings.

Appropriate comment in the 'comments' column and 'status of review' column will be marked.

Comment	Status of Review
As noted	Revise and resubmit for review
No comments	Proceed as noted and submit revised docs. For records
Not reviewed	No further review required Forward final docs. as per P.O.

6.4.0. All documents received in FACT shall be dispatched after review within 15 days from the date of receipt. Vendor shall notify FACT of non-receipt of reviewed documents in time immediately, to take corrective actions.

6.5.0. The delivery of the equipment shall in no case be linked with the review of the vendor drawings and data by FACT. It is the sole responsibility of the vendor to execute the job as per the purchase order conditions. If required the vendor shall depute his technical personnel to FACT after submission of documents for timely finalisation of documents.

VENDOR DATA INDEX

CD-110SS-11kV-VDI

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PROJECT: SUPPLY OF 11kV, 1250A, 40kA SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS

PROJECT NO. :

VENDOR:

ITEM: 11kV, 1250A, 40kA, 20 CUBICLE SWITCHBOARD

P.O NO.:

DATE:

Sl. No.	Doc. / Drawing No.	Description	Rev. 0 / Date	Rev. 1 / Date	Rev. 2 / Date	Rev. 3 / Date	Rev. 4 / Date	Rev. 5 / Date	Relevant to This issue

ISSUE NO.															
DATE															
SIGNATURE															

FACT CD

	VENDOR DATA REQUIREMENTS	CD-110SS-11kV-VDR	
		Page 1 of 2	R1

PROJECT: SUPPLY OF 11kV, 1250A, 40kA VCB SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS
ITEM: 11kV, 1250A, 40kA SWITCHBOARD

TPS. NO: CD-110SS-11kV-SB

STATUS : ■ **ENQUIRY** ☐ **COMMITMENT** **P.O. NO.:**

Sl. No.	Grp. code	Description	Offer	After commitment				@@ Final
			Qty.	Qty.	Lead time in weeks			Qty.
					Reqd.	@ Propd	Agrd.	
1.0	B	Duly filled in Technical particulars of 11kV, 1250A, 40kA switchboard as per pro forma enclosed	1S	2P	4			4P+1S
2.0	A	Dimensioned general arrangement drawings – internal & external, including busbar disposition		2S	4			4P+1S
3.0	A	Sectional views showing the general constructional features of the circuit breaker including operating mechanism, arcing chambers, contacts with lifting dimensions for maintenance.		2S	4			4P+1S
4.0	A	Foundation plan showing cutouts / floor openings and foundation pockets. Loading data and foundation design		2S	4			4P+1S
5.0	A	Bill of material for complete switchgear		2S	4			4P+1S
6.0	B	Single line diagram, control schematic, wiring diagrams, inter panel wiring, terminal and bus wiring diagrams		2S	4			4P+1S
7.0	B	Schedule of material / components		2S	4			4P+1S
8.0	B	Characteristic curves of relays and their range of adjustments		2S	4			4P+1S
9.0	B	Type test certificates of the switch gear assembly	1S	2S	4			4P+1S
10.0	C	Routine test certificates		2S	4			4P+1S

Legend: Notes: @ @@	Group code: A - For review and detailed Engineering, B - For review, C - For information and record Document type: S – Soft copy, P – Print. Vendor shall fill in proposed lead time if different from the required lead time. Each set of final documents shall be submitted in a folder. Two such folders shall be packed and dispatched with the equipment.

R1	07.01.2022	REV1	DVS	KPN	BKN
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REV.	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

FACT CD

PROJECT: SUPPLY OF 11kV, 1250A, 40kA SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS
ITEM: 11kV, 1250A, 40kA SWITCHBOARD

TPS. NO: CD-110SS-11kV-SB

STATUS : ■ **ENQUIRY** ☐ **COMMITMENT** **P.O. NO.:**

Sl. No.	Grp. code	Description	Offer	After commitment				@@ Final
			Qty.	Qty.	Lead time in weeks			Qty.
					Reqd.	@ Propd	Agrd.	
11.0	B	Certificate of short circuit rating of breakers	1S	2P	4			4P+1S
12.0	B	Test certificates of bought out items like protective relays,VTs, CTs, energy meters etc.						4P+1S
13.0	B	Technical literature, pamphlets and brochures relating to the various equipments used.	1S	2S				4P+1S
14.0	C	Operation and maintenance manuals		2S				4P+1S
15.0	B	Duly filled and signed Compliance statement as per proforma enclosed	1S					
16.0	B	Unpriced copy of price bid	1S					4P
17.0	A	Relay co ordination details, with recommended settings, calculations, etc.		2S	12			4P+1S
18.0	A	Dimensioned drg. of bus trunking flange showing busbar arrangement, bolt hole, etc.		2S				4P+1S
19.0	B	Type test certificate of numerical relays.		2S				4P+1S

Legend:	Group code: A - For review and detailed Engineering, B - For review, C - For information and record Document type: S – Soft copy, P – Print.
Notes: @	Vendor shall fill in proposed lead time if different from the required lead time.
@@	Each set of final documents shall be submitted in a folder. Two such folders shall be packed and dispatched with the equipment.

R1	07.01.2022	REV1	DVS	KPN	BKN
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REV.	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

FACT CD

CONTENTS

1.0.0 SCOPE

1.1.0 This specification covers the general requirements for supply and installation of all electrical items as applicable.

2.0.0 REFERENCES

2.1.0 The following documents shall be read in conjunction with this specification.

2.1.1 Data sheet of 'General Requirements for Electrics'.

2.1.2 Engineering specifications, data sheets and Technical particulars of individual equipment / items.

2.1.3 Scope of work, Scope of Inspection and Tests, Vendor data requirements, etc attached with the Technical procurement specifications

3.0.0 COMPLETENESS OF CONTRACT

3.1.0 The electrics supplied / installed shall be complete with all accessories for the safe, smooth and efficient operation of the system. Such parts shall be deemed to be within the scope of this specification whether specifically mentioned or not.

4.0.0 COMPONENTS AND CONSTRUCTION

4.1.0 Each and every component shall be of reputed make and be of proven design for reliability and durability. They shall be brand new. Workman ship shall be of the highest grade and the entire construction shall be in accordance with the best modern engineering practice.

5.0.0 STANDARDS & REGULATIONS

5.1.0 All electrical equipment / installations shall fully comply with the requirements laid down in the following rules / regulations / acts / standards / codes as amended up to date.

5.1.1 Indian Electricity Rules.

5.1.2 Indian Electricity Act.

5.1.3 Indian Electricity Supply Act.

5.1.4 Indian Factories Act.

5.1.5 Fire Insurance Act.

5.1.6 Standards / regulations of statutory bodies applicable for the place of installation.

5.1.7 Relevant Indian / International standards and in their absence, the standards of the country of manufacture.

5.2.0 Vendor shall furnish all necessary documents & provide assistance for obtaining approval from statutory bodies.

5.3.0 All equipment shall be of tropical design according to relevant Indian / International Standards.

6.0.0 SERVICE CONDITIONS

6.1.0 All equipment shall be suitable for the service conditions specified in the Data sheet of 'General Requirements for Electrics' attached.

7.0.0 EARTHING

7.1.0 Duplicate earthing terminals, suitable for terminating earthing conductors of sizes indicated in the data sheet shall be provided on the body of the equipment apart from those, if any, provided inside the cable chambers.

8.0.0 POWER SUPPLY DETAILS

8.1.0 The equipments shall be suitable for the power system details furnished in the Data sheet of 'General Requirements for Electrics' unless otherwise specified in the data sheets of individual equipment.

8.2.0 The equipment shall perform satisfactorily even with variation in supply voltage and frequency as detailed in the data sheets. The equipment shall operate at the specified rating without exceeding the permissible temperature rise as per the relevant I.S. in spite of the variation in supply voltage and frequency.

9.0.0 NAME PLATES

9.1.0 Necessary nameplates, conforming to standards, giving relevant details of the equipment, shall be provided on individual equipment. Any additional details shall also be indicated in the nameplate, if so specified in the specifications / data sheets of individual equipment.

10.0.0 PAINTING

10.1.0 Unless otherwise specified in the specifications / data sheets of individual equipment / items, painting procedure described in this clause shall be adopted.

10.2.0 All exposed metal parts shall be subjected to at least the following pretreatment before painting to suit the material and environment involved.

10.2.1 De-greasing.

10.2.2 Rust removing.

10.2.3 Phosphating/ equivalent chemical treatment.

10.2.4 Giving two coats of corrosion resistant primer suitable for final coating.

10.3.0 Two coats of anticorrosive painting shall be given after the above process so as to render the materials suitable for the highly corrosive environment specified.

10.4.0 Vendor shall furnish detailed painting procedure proposed, along with the bid.

11.0.0 INTER-CHANGEABILITY

11.1.0 All similar parts shall be inter-changeable with each other.

12.0.0 DANGER NOTICE PLATES

12.1.0 Danger Notice plates conforming to IS: 2551 and other statutory requirements shall be affixed on equipment wherever required.

13.0.0 TOOLS AND APPLIANCES

13.1.0 The vendor shall supply without any extra cost one set of special tools and appliances that may be required for carrying out the maintenance, special inspection etc. of the equipment offered.

13.2.0 Vendor shall also furnish list of tools and appliances required for different equipment.

14.0.0 SERVICES OF MANUFACTURERS' TECHNICAL EXPERTS

14.1.0 Services of the manufacturer's technical experts shall be made available to the Purchaser, if found necessary, during erection, testing, and commissioning and also during the guarantee period.

15.0.0 TRAINING

15.1.0 The vendor shall render all facilities free of cost for imparting training to purchaser's technical personnel at manufacturer's works, if required, for the proper assembly, installation, testing, commissioning, operation and maintenance of the equipment supplied. The travel and living expenses of the personnel deputed for training will be borne by the Purchaser.

16.0.0 PERFORMANCE FIGURES

16.1.0 Duly filled in 'Technical Particulars' of individual equipment / item shall be furnished as per formats attached. Performance figures of the equipment as per 'Technical particulars' furnished along with the offer shall be guaranteed.

17.0.0 TESTS

17.1.0 All the tests specified in 'Scope of Inspection & Tests' attached separately with the Technical procurement specification shall be performed.

18.0.0 DOCUMENTS

18.1.0 Drawings and documents shall be furnished as per 'Vendor Data Requirements (VDR)' attached with Technical Procurement Specification.

19.0.0 INSTRUCTIONS TO THE TENDERER

19.1.0 Drawings and documents as per VDR shall be furnished along with the quotation. Offers without these details will be treated as incomplete and are liable for rejection.

19.2.0 In the absence of clearly spelt - out item wise deviations from purchaser's specification, it will be presumed that the equipments offered are in conformity with the specification.

19.3.0 Vendor shall obtain Purchaser's approval for makes of different electrical items / components wherever makes are not specified in the respective data sheets.

19.4.0 In case of conflicting requirements, stipulations in the respective Data Sheets shall prevail.

19.5.0 The manufacturer shall ensure approval of drawings before fabrication/assembling. However it doesn't relieve of the responsibility of timely delivery of the switchgear assembly.

1.0	**Project**	Supply of 11kV, 1250A, 40kA switchboard for replacing Crompton & Voltas switchboards.		
2.0	**Owner**	FACT-CD		
3.0	**Location**	Ambalamedu, Kochi		
4.0	**Service conditions**			
4.1	Altitude	4600mm above mean sea level		
4.2	Humidity Min (monthly avg.)	57%		
4.3	Humidity max (monthly avg)	98%		
4.4	Humidity design	100% at 40^0C		
4.5	Ambient temperature ^{0} C-Min.	18		
4.6	Ambient temperature ^{0} C-Max.	40		
4.7	Ambient temperature ^{0} C-Design	45		
4.8	Rain fall - Average annual	281.7 cm		
4.9	Rain fall - Max recorded /month	760 mm		
5.0	**Environment**	Highly corrosive industrial area, Presence of SO_2 and other corrosive gases and chemical dusts, which can form conductive tracks.		
6.0	**Wind velocity for structural design**	124 km/h		
7.0	Seismic factor for design	Within seismic Zone III as per IS 1893 (1975)		
8.0	Soil data			
8.1	Soil resistivity	-		
8.2	Type of soil (hard / loose)	-		
9.0	**Power system**			
9.1	Voltage (V) & Variation (± %)	11000V +/- 10%	3300V +/- 10%	415V +/- 10%
9.2	Frequency (Hz) & Variation (± %)	50Hz +/- 5%	50Hz +/- 5%	50Hz +/- 5%
9.3	No of phases	Three	Three	Three
9.4	No. of wires	Three	Three	Four
9.5	Fault level (MVA)	715	150	35
9.6	Method of neutral earthing	Solid earthing	Solid earthing	Solid earthing

					PROJECT	**SUPPLY OF 11kV, 1250A, 40kA SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS**
					OWNER	**FACT-CD**
1	**07.01.2022**	**DVS**	**KPN**	**BKN**	**P.O. NO.**	
0	**15.10.2021**	**DVS**	**KPN**	**BKN**	**VENDOR**	
REV.	**DATE**	**PRPD.**	**CHKD.**	**APPRD.**		

FACT CD

1.0.0 SCOPE OF WORK

1.1.0 This specification covers design, engineering, manufacturing, shop testing, inspection, packing and delivery to site of 11kV, 1250A, 40kA Vacuum Circuit Breaker switchboard for 110kV substation to give reliable and continuous operation at the load rating specified in the data sheets/ single line diagram.

1.2.0 The equipment offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

1.3.0 The design of the switchgear should be exclusive and specific responsibility of supplier and should comply with current good engineering practice, the relevant codes and recommendation, the project specific requirements etc.

2.0.0 REFERENCES

2.1.0 The following documents shall be read in conjunction with this specification.

2.1.1 Engineering specification of general requirements for electrics (Tag no. 13ES900/94/R1).

2.1.2 Data sheet of HVSB (11kV) Thermal (Tag no. CD-110SS-11kV-SB-DS).

2.1.3 Technical particulars of High Voltage Switchboard (11 KV) (Tag no. CD-110SS-11kV-SB-TPSV).

3.0.0 STANDARDS

3.1.0 Requirements laid down in the latest revisions of the following Indian Standards or other relevant IEC standards shall be strictly adhered to

IS:13118	Circuit breakers
IS:3427	Metal enclosed switchgear and control gear for voltages above 1000 V
IS:5578	Guide for marking of insulated conductors
IS:10118	Code of practice for selection, installation and maintenance of switch gear and control gear
IS:10601	Dimensions of terminals of high voltage switchgear and control gear
IS:11353	Guide for uniform system of marking and identification of conductors and apparatus terminals
IS:722	AC electricity meters
IS:1901	Visual indicator lamps
IEC 60255	Measuring relays and protection equipment
IS:2551	Danger Notice Plates
IS:2705	Current Transformers
IS:3043	Code of practice for earthing
IS:3156	Voltage Transformers
IS:3231	Electrical relays for power systems protection

IS:3842	Application guide for electrical relays for ac systems
IS:4146	Application guide for Voltage Transformers
IS:4201	Application guide for CTs
IS:4483	Flush mounting IDMTL relays
IS:6875	Push buttons and related control switches (for voltages up to and including1000Vac and 1200 V dc)
IS 12729	General Requirements for switchgear and control gear for voltages exceeding 1000 V
IS 12063	Degree of protection provided for enclosures for electrical equipment
IS 11353	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals

4.0.0 SUPPLY CONDITIONS

4.1.0 The equipment to be supplied shall be designed to operate satisfactorily at the rated load under the supply conditions specified in the data sheet.

5.0.0 CONSTRUCTION

5.1.0 GENERAL

5.1.1 The load bearing components of switchboard shall be of min. 2mm thick folded sheet steel construction, fully enclosed, dust, damp and vermin proof, indoor cubicle type, floor mounted and free standing type, internal arc tested for designed fault current, fitted with floor rolled truck mounted Vacuum circuit breaker in fully horizontal draw out execution and horizontal isolation type. Vertical units shall be assembled to form a continuous line up of uniform height and front line-up.

5.1.2 Vacuum circuit breaker shall be truck mounted so that it directly rolls on to the floor when taken outside without usage of any external breaker handling truck. Cassette type breakers are not acceptable.

5.1.3 Rated short time withstand current of the switchboard shall not be less than the system short circuit level specified for 1 second. Rated peak withstand current of the switchboard shall not be less than 2.5 times the system short circuit level.

5.1.4 Degree of protection shall not be less than IP 4X.

5.1.5 Each CB shall be housed in a separate compartment and shall be enclosed on all sides. Adequate provision shall be made for escape of hot gases and shall be so located as to direct the hot gases away from operating personnel.

5.1.6 Each cubicle shall be of compartmentalized construction and shall have following separate compartments:

- Main compartment for housing the draw out trucks.
- HV bus bar compartment.
- Compartment for CT and outgoing cable/bus terminations.
- LV Compartment

5.1.7 Front access with hinged doors shall be available to all components in the cubicle, which require adjustment, maintenance or replacement. All doors shall be hinged at one end and shall be bolted (knob type) on the other end. All hinges shall be of concealed design for elegant appearance.

5.1.8 Rear access shall be available to cable box, cable glands etc. with bolted covers.

5.1.9 All barriers used shall be manufactured from non-inflammable material. All hardware shall be corrosion resistant. Door & openings shall be provided with neoprene gaskets.

5.1.10 Switchboard comprising of a number of CB panels, shall be of unit construction to enable the board to be broken down into sections for shipping to site and to be correctly reassembled and erected on prepared foundations without skilled supervision. Inter panel and inter compartmental wiring shall preferably be protected by heavy gauge solid metal conduit or trunking or suitable grommet.

5.1.11 The construction of switchboard shall be reliable, safe, self-contained, compact, interchangeable, accessible, easily extensible at both ends and complete with all positive mechanical interlocks. Adequate lifting facilities shall be provided on each section.

5.1.12 The switchboard shall comply loss of service continuity category of LSC 2B and internal arc classification IAC A FLR. Type test reports for the same shall be submitted.

5.2.0 MOVABLE SECTION

5.2.1 Floor roll out, horizontal draw out and horizontal isolation type movable truck of the circuit breaker shall be mounted on suitable rollers and it shall be complete with circuit breaker poles, operating mechanism, plug in connectors, etc.

5.2.2 If independent poles are envisaged for the circuit breakers for housing CB contacts and the rupturing chamber, it shall be fixed to the rigid sheet steel chassis on the movable truck.

5.2.3 Closing and opening mechanism, interlocks, connecting links, coils for close and trip etc. shall be provided on the movable chassis.

5.2.4 An arrangement in which the panel door is integral with the circuit breaker truck is not acceptable. It shall be possible to close the panel door after the circuit breaker is fully drawn out of the panel. If an arrangement is possible by which the panel door can be closed, even when the circuit breaker truck remains inside the panel in the isolated position, the same will be preferred over other designs.

5.3.0 FRONT COMPARTMENT RECEIVING THE MOVABLE TRUCK

5.3.1 This compartment shall include automatically operated shutters for automatically screening the stationary plug-in connections with facility for padlocking the shutters in closed position.

5.3.2 The switchgear cubicle shall be provided with a position changing gear arrangement in such a way that by engaging detachable device from outside the front door, it shall be possible to move the breaker truck and change position without opening the cubicle door.

5.3.3 Proper guide rails for easy insertion and withdrawal of the circuit breaker shall be provided. Different positions of the CB like service, test and isolated positions shall be clearly marked. Adequate barriers shall permit personnel to work safely within an empty breaker compartment, with the bus bars energized.

5.4.0 CABLE HEAD COMPARTMENT

5.4.1 Cable head compartment of the panel board so designed to receive wound or bar primary current transformers in addition to cable incoming/ outgoings.

5.4.2 Rear bottom plates of the cable compartment shall be fitted with removable gland plates of adequate size for fixing the cable glands.

5.4.3 Cable compartment shall be robust enough & self-supporting. The design shall be such that the weight of the power cable within the compartment shall not cause direct pressure on the C.T studs. Compartment for cable connection shall allow cable pulling, termination and connection work with switchgear energised.

5.5.0 BUS BAR COMPARTMENT

5.5.1 Bus bars shall be housed on a separate compartment and shall be accessible for inspection only with special tools. In the bus bar compartment of the CB, the triple pole bus bars shall be arranged on supports like araldite epoxy resin, to provide long air insulation distance and creepage path.

5.5.2 The bus bar compartment shall be provided with bolted covers. Necessary extra precaution like additional cover, caution signs etc. shall be provided to prevent inadvertent contact with live bus bars.

5.6.0 LOW VOLTAGE COMPARTMENT

5.6.1 LV compartments containing metering, protection, and control equipment shall be so designed and constructed, that these shall permit, accessibility for inspection or checking without the need of de-energizing the switchboard. It shall preferably be mounted on top of the front compartment receiving the movable section of the CB.

5.6.2 The mounting of the instruments shall be such that vibrations generated by switching operations do not affect them. Mounting of relays & meters on the rear is not acceptable.

5.6.3 All relays and meters mounted on this compartment shall be flush type and different items shall be logically laid out on the front of this compartment.

5.6.4 Relays that require adjustment, resetting etc. shall be mounted at reasonable operating height from the floor level.

5.7.0 ACCESSIBILITY

5.7.1 Checking and removal of components shall be possible without disturbing adjacent equipment. All auxiliary equipment shall be easily accessible.

5.7.2 Access to bus bar chamber, CTs, etc. shall be through rear bolted covers. It shall be possible to set all 'measuring' relays 'in situ' without de-energizing the switchboard.

6.0.0 CIRCUIT BREAKER

6.1.0 The circuit breaker shall be of suitable type and rating as mentioned in the data sheet and suitable for indoor use. The CB shall be of three pole, horizontal draw out, horizontal isolation and floor roll-out type unless otherwise specified in the data sheet. The breaker shall be E2/C2 and M2 class type tested. The ratings specified shall be for operating condition inside the panel, at site.

6.2.0 Rated operating duty shall be O-3s-CO-3min-CO.

6.3.0 Total circuit breaker operating time must be less than 75ms.

6.4.0 All parts of the CB shall be liberally dimensioned to have high factor safety to withstand electrical and mechanical stresses during the normal operation of the breaker and during short circuits.

6.5.0 Breakers of same rating shall be interchangeable. Wiring and termination of plug-in contacts shall be identical in all interchangeable breakers.

6.6.0 Non-reset type operation counter shall be provided

6.7.0 CIRCUIT BREAKER CONTACTS

6.7.1 The CB contacts shall be adjustable to allow for wear, be easily replaceable and shall have the minimum movable parts and adjustments.

6.7.2 The breaker isolating contacts shall be of self-aligning type and shall have ample area and contact pressure for carrying the rated current and short circuit currents such that there is no excessive temperature liable to bring about pitting or welding and it shall not show tendency to “blow off” when carrying rated short circuit currents.

6.7.3 A minimum of 3 sets of reversible and adjustable auxiliary contacts are to be provided on breaker operating mechanism as spare, exclusively for the use of purchaser.

6.7.4 Auxiliary contacts shall have a minimum continuous rating of 10A at 230V. Multiplication shall be done only mechanically. All auxiliary contacts shall be wired to the terminal block. Auxiliary contacts and limit switches shall be in dust tight enclosures.

6.8.0 OPERATING MECHANISM

6.8.1 The operating mechanism of the CB shall be quick make, quick break type and trip-free as per relevant code of practice.

6.8.2 Circuit breaker shall be provided with electrically operated motor charged spring closing mechanism with provision for manual charging through handle. Necessary operating handles shall also be supplied.

6.8.3 In motor charged spring closing mechanism, the charging of the closing spring shall be automatically initiated after every closing operation. It shall be ensured that the closing operation shall be possible only when the springs are fully charged. Suitable protection circuit, limit switches, etc. shall be provided for protection of the spring charging motor and to cut out the motor when the springs are fully charged.

6.8.4 The closing solenoids / coils and auxiliary devices shall operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet. Trip coils shall operate satisfactorily at all voltages between 70% and 110% of the rated auxiliary voltage.

6.8.5 Irrespective of the mode of operation of the breaker, independent manual closing and tripping arrangements shall also be provided as a standard feature for emergency and testing purpose.

6.8.6 A mechanical interlock shall be provided for preventing any inadvertent / undesired operation. For instance, closing the breaker when the springs are being charged, withdrawing of breaker from service position while breaker is ON condition etc.

6.8.7 Anti-pumping relay & circuitry/anti pumping feature shall be provided in the closing circuit of the CB to ensure that it does not re-close automatically after a tripping or in the case of failure to close, even if the closing impulse is maintained.

6.8.8 The control circuit shall be suitable for local as well as remote control. Each control circuit tapping shall be provided with fuses.

6.8.9 The control and other auxiliary connections from the CB to the cubicle shall be through plugs and sockets, mechanically coded, rated for 10A (minimum) / 650V, located at either ends and connected through flexible jumpers. Provision for locking of control plug to avoid looseness during operation shall be provided.

6.8.10 The jumpers shall have sufficient number of spare cores to utilize all the spare auxiliary contacts and it shall be long enough to maintain connection in the test position of the truck. The multi-pin plug provided shall have scraping earth terminals.

6.9.0 CB POSITIONS AND INDICATION

6.9.1 There shall be three distinct positions for circuit breaker, viz. service position, test position and isolated position and these positions shall be clearly marked and provided with mechanical stops at each position. Circuit breaker shall be electrically and mechanically trip free in all positions. The test position shall have locking device. Fully racked in, racked out, and isolated positions shall also be clearly marked.

6.9.2 It shall be possible to release the mechanical stop of the truck in the test position in order to draw-out the truck fully after severing the control connections.

6.9.3 Shutters shall automatically screen cable and bus bar isolating connections before the CB reaches isolation position.

6.9.4 An automatic visual indication shall be provided to indicate spring charged / discharged conditions.

6.9.5 All circuit breakers shall have mechanical ON/OFF indicator and spring charge indicator. These shall be visible from the front without opening the panel door.

6.10.0 POSITIVE INTERLOCKS OF THE CB

6.10.1 It shall not be possible to close the circuit breaker unless it is fully plugged in (truck in service position) or fully isolated (truck in the test position) or has been completely removed from the cubicle.

6.10.2 It shall not be possible to discharge the closing spring if the CB is in closed position already.

6.10.3 It shall not be possible to close the circuit breaker unless the closing spring is fully charged.

6.10.4 Interlock shall be provided to prevent pushing in /drawing out of the breaker truck when the breaker is in the closed position.

6.10.5 Truck cannot be racked into service position with door open and control connection disengaged. Insertion of breaker into `Service' position shall not be possible if safety shutters are not free. Door interlock shall have defeat feature.

6.10.6 Control connections cannot be disengaged with the truck in `Service'.

6.10.7 Padlocking facility in test & service position to be made available.

6.10.8 Mechanical (Castell key interlock) and electrical interlocks shall be provided for Incomers and bus coupler Circuit Breakers for preventing parallel operation of the incomers. Keys shall be trapped in circuit breaker "CLOSED" condition and free in circuit breaker "OPEN" condition.

6.10.9 Busbar / circuit marking on safety shutters shall be provided.

6.10.10 The above positive interlocks are the minimum requirements. Manufacturers can include any other safety interlocks, which may be necessitated by the particular design feature of the CB.

7.0.0 BUSBARS

7.1.0 The arrangement of bus bars shall be as per relevant standards. All phase bus bars shall be of uniform cross section throughout the switchboard.

7.2.0 Bus bars shall be of high conductivity aluminium / copper as specified in the data sheet. Bus bars shall be continuously rated for the rated current and service conditions specified.

7.3.0 Bus bars shall be provided with heat shrinkable, non-tracking, low absorption type PVC insulated sleeves of rated voltage insulation of the switchboard.

7.4.0 Busbar joints and tap-offs shall be shrouded with removable shrouds of rated voltage insulation.

7.5.0 Maximum allowable current density for bus bars shall be 1.25 A/mm^2 for copper conductor and 0.78 A/mm^2 for aluminium conductor.

7.6.0 The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet.

7.7.0 Rigid insulating barriers/ protection guards, wire meshes shall be provided between the group of line bus bars and other parts, so as to eliminate danger to personnel due to accidental contact.

7.8.0 Thermal design of the bus bars shall be based on installation of the switchgear in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure.

7.9.0 The busbar supports shall be non-hygroscopic epoxy resin material (or glass reinforced plastic) with anti-tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam is not acceptable.

7.10.0 The bus bars and bus supports shall withstand the dynamic, thermal and magnetic stresses and strains due to the maximum short circuit current corresponding to the fault level indicated in the data sheet, without any deformation, deterioration or damage.

7.11.0 Suitable provisions shall be made for the expansion and contraction of the bus caused by temperature variation and due consideration shall be given for reactance, proximity and skin effects also, while choosing the sizes and spacing of bus bars.

7.12.0 It shall be possible to extend the bus bars on either side without any further fabrication / modification on the existing bus bars. Removable end covers with fixed nut and bolting arrangement shall be provided on either end and the ends of the bus bars shall be suitably drilled.

7.13.0 Appropriate identification marking / labels shall be provided on the bus bars and tapings for distinguishing the various phases.

7.14.0 Due allowance shall be given in the sizing of the bus bars in case of insulated bus bars.

8.0.0 INSTRUMENT TRANSFORMERS

8.1.0 <u>CURRENT TRANSFORMER</u>

8.1.1 CTs shall conform to relevant Indian / International standards and shall be cast resin insulated. They shall be mounted on switchgear stationary part.

8.1.2 CTs shall withstand the maximum short circuit current for a minimum of one second and it shall be designed to withstand stresses resulting from the maximum short circuit currents.

8.1.3 CTs for metering and protection shall be selected suitably to meet the individual requirements of meters and relays specified in the data sheet. Low reactance CTs shall be used for protection.

8.1.4 CTs for metering purposes shall have adequate capacity to cater for 130% of full load conditions. Instrument security factor for metering CTs shall not be more than 5 and shall have an accuracy class of 1, unless otherwise specified.

8.1.5 CTs for protection purposes shall have sufficient accuracy, burden and accuracy limit factor for necessary coordination / discrimination for clearing the faults. Accuracy limit factor for protection shall not be less than 20 and accuracy class shall be 5P.

8.1.6 Separate CTs / cores shall be used for metering and protection. Dual purposes CTs are not acceptable.

8.1.7 CTs shall have class E insulation.

8.1.8 CTs shall be provided with polarity markings adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.

8.1.9 Unused CT terminals must be short-circuited.

8.1.10 CTs shall have solidly earthed system.

8.1.12 The CT terminals that have been used shall be provided with links to facilitate shorting as and when required (when load / burden on CT is disconnected).

8.1.13 All live terminals shall be shrouded to prevent accidental contact.

8.2.0 POTENTIAL TRANSFORMER

8.2.1 PTs shall conform to relevant Indian / International standards and shall be cast resin insulated.

8.2.2 PTs shall have suitable accuracy and capacity for the satisfactory operation of the protection, instrumentation and metering specified in the data sheet / drawings enclosed. The class of accuracy and the burden on PTs selected shall be adequate for the destined different purposes.

8.2.3 Potential transformer shall be of 'fully draw out' type and shall be provided with HRC fuses on both HV and LV sides. The draw out mechanism shall disconnect the bus bars and the primary connection shall be disconnected before the PT or its primary fuses become accessible. PT mounted inside cable chamber is not acceptable.

8.2.4 The primary rated voltage shall be equal to the rated voltage of the system and unless otherwise specified, secondary voltage shall be 110V.

8.2.5 PTs shall have solidly earthed system.

8.2.6 PTs shall have class E insulation.

9.0.0 PT SELECTION SCHEME

9.1.0 PT selection scheme shall be provided in the bus coupler panel. PT voltage supply to the bus sections shall be fed from the respective incomer's PT secondary in normal conditions.

9.2.0 When entire panel is charged using only one incomer through bus coupler, PT supply to the entire panel shall be from PT secondary of incomer in charged condition.

9.3.0 It shall be possible to parallel the incomer-1 PT secondary, incomer-2 PT secondary and incomer-3 PT secondary when all or 2 incomers are in paralleled condition.

10.0.0 PROTECTION RELAYS

10.1.0 GENERAL

10.1.1 Relays shall conform to IS: 3231/IEC 60255 or to relevant Indian / International standards.

10.1.2 Numerical relays shall have control, measurement and supervision. They shall be back connected, drawout / plug-in type suitable for flush mounting and fitted with dust tight covers.

10.1.3 Relays shall be flush mounted, back connected and of a type and make approved by the buyer. List of acceptable makes is indicated in the data sheet.

10.1.4 Relays shall have hand reset type flag indicators and initiating contacts. It shall be possible to reset the flag without opening the relay case. Flag indicators shall be visible from the front side of the CB panel.

10.1.5 Window type annunciators with labeling shall be provided, in case flag indicators are not available for visual identification of the faults.

10.1.6 All the relays shall have minimum 2 nos. of potential free auxiliary contacts in required combination.

10.1.7 Relays shall be compatible with protection CT secondary current of 1A/5A as indicated in the data sheet.

10.1.8 Relays shall be suitable for auxiliary (control) power supply of 110V DC with 90-110% variation.

10.1.9 The IDMT characteristic of the relays shall follow tripping curves of IEC standard.

10.1.10 Numerical relays shall have self-monitoring facility and it shall have relay healthy/relay in operation indication on the fascia.

10.1.11 Numerical relays shall have minimum of 2 numbers of programmable binary inputs and programmable binary outputs. It shall also have oscillography record and event recorder of minimum 10 events.

10.1.12 Numerical relays shall support both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol together with the DNP3, IEC 60870-5-103, Ethernet IEC-61850 and Modbus protocols. Numerical relays shall have Ethernet connectivity with necessary software for PC interface and programming. They shall have RS485/Ethernet/USB communication ports for interfacing with relay.

10.1.13 Numerical relays shall have LCD/LED display unit, keypads, LED indicators and communication port for parameter setting, monitoring and controlling the protection relay. Adequate push buttons shall be provided on the fascia to display and edit the relay settings, to display and activate the control segment of the relay, to display the relay's instrumentation and fault data and to reset the output relays and LEDs.

10.1.14 Numerical relays shall have minimum 2 numbers of programmable LED indications on the fascia.

10.1.15 The vendor shall supply software of numerical relay, compatible with MS Windows (XP SP2, Win7-32bit or Win7-64bit) and provide configuration support during the erection and commissioning of the switchboard. Relay technical catalogue, operation manuals, brochures etc. shall be supplied in both hard and soft copies.

10.1.16 Synchro check relay shall be capable of checking the synchronism between two incomers. It shall facilitate the paralleling of the two incomers by giving close permission to bus coupler circuit breaker. Dry NO contact can be used for providing close permission. The relay shall be operated through a 2-pole switch.

10.2.0 NUMERICAL FEEDER & TRANSFORMER PROTECTION RELAY

10.2.1 The numerical feeder protection relay shall be designed for the main protection of medium voltage feeders and main protection for underground cable feeders in distribution networks. The numerical transformer protection relay shall be designed for the main protection of low power transformers (less than 10 MVA). Both the relays shall be compatible for solidly grounded networks.

10.2.2 The protective relay shall be multifunction type with protection features such as Phase time & instantaneous overcurrent, Ground time & instantaneous overcurrent, Thermal image, circuit breaker failure to open, trip circuit supervision etc.

10.2.3 The relay shall have metering of phase and ground currents, thermal image etc.

10.3.0 NUMERICAL CAPACITOR BANK PROTECTION RELAY

10.3.1 The numerical capacitor bank protection relay shall provide comprehensive protection, control, measurement and supervision of capacitor banks.

10.3.2 The protection relay shall be multifunction type with protection features such as Capacitor bank overload & unbalance protection, non-directional overcurrent & directional earth-fault protection, voltage & frequency based protection, current-based unbalance protection with compensation for natural unbalance, re-connection inhibit for capacitor bank and measurement functionality.

10.3.3 The relay shall have metering of phase and unbalance currents, kVAR, trip circuit supervision etc.

10.4.0 AUXILIARY RELAY

10.4.1 Auxiliary relays shall be provided for transformer feeders for trip & alarm conditions of oil temperature, winding temperature and Buchholz relay.

10.5.0 TRIPPING RELAY

10.5.1 High speed, high burden hand reset master trip relays shall be provided to trip the VCBs.

11.0.0 DIGITAL MULTI FUNCTION METER (MFM)

11.1.0 MFM shall be flush mounted and of a type and make approved by the buyer.

11.2.0 Meters shall be of reputed make and shall conform to relevant Indian standards.

11.3.0 MFM shall have load survey facility and should support integration to PLC/SCADA system using Modbus RTU protocol through the inbuilt RS 485 serial communication port.

11.4.0 The front panel shall have LED display screen. MFM meters shall have Three-Phase Electrical Instrumentation and load management facilities with time stamping in a compact and rugged construction. The MFM shall provide accurate 1 second measurements of V,I, PF, Frequency, Power, unbalance etc.

11.5.0 Meter shall be configurable for 5 A or 1 A secondary CTs.

11.6.0 The meter shall have accuracy class 0.2 or better.

11.7.0 MFM meters shall be configurable & programmable through the front panel.

11.8.0 All meters shall be square type of size 96 mm x96 mm. unless otherwise specified.

11.9.0 All meters shall be magnetically screened and temperature compensated.

11.10.0 The MFM shall measure and display the following parameters:

- Per phase and 3 phase Voltage, Current, PF, Power
- Frequency
- THD – V & I
- Energy – Real, Reactive, Apparent
- Demand – kVA,kVAR,kW,I
- Voltage and current unbalance

11.11.0 It should be possible to access most of the meter's real-time and logged data, as well as basic configuration, meter features, Modbus register list etc using a Modbus command interface.

12.0.0 ANNUNCIATION SCHEMES

12.1.0 Separate visual and audible annunciation scheme shall be available for

a) Automatic tripping on fault conditions
b) D.C. failure condition
c) Non-trip alarm conditions

12.2.0 Common facilities and accessories for the trip annunciation scheme & DC failure annunciation scheme like flasher relay, hooter, buzzer, push buttons (Accept, reset, test), etc, shall be mounted on the bus coupler panel. Alarm operation and cancellation relays for trip annunciation scheme shall be mounted on the respective panels, wherever indicated in the data sheet. The trip annunciation schemes shall be rated for D.C. auxiliary supply indicated in the data sheet covering the switchboard.

12.3.0 AUTOMATIC TRIPPING ON FAULT AND NON-TRIP ALARM CONDITIONS

12.3.1 Each protection relay's trip and alarm contacts shall be wired to the scheme. Also the contacts of the auxiliary relay for trip and alarm conditions of transformer feeders (Oil temp., winding temp., Buchholz relay) shall also be wired to the scheme.

12.3.2 An annunciation panel suitable for displaying the trip/non trip conditions with minimum 3 no of spare windows shall be provided on the bus coupler panel. Following details shall be displayed in the windows:

a) Incomer-1 Trip
b) Incomer-2 Trip
c) Incomer-3 Trip
d) Incomer-4 Trip
e) CSS FDR-1 Trip
f) CSS FDR-2 Trip
g) Lake View S/S Trip
h) RPH S/S Trip
i) NPK FDR-1 Trip
j) NPK FDR-2 Trip
k) UTILITY FDR-1 Trip
l) UTILITY FDR-2 Trip
m) CAP BANK Trip
n) STATION TRF-1 Trip
o) STATION TRF-2 Trip
p) STATION TRF-1 Oil/winding temp/Buchholz alarm
q) STATION TRF-2 Oil/winding temp/Buchholz alarm
r) Spare-1
s) Spare-2

12.3.3 In the event of a fault/alarm, respective protection/auxiliary relay shall initiate the Trip/Non-Trip alarm annunciation scheme. The respective window in the alarm fascia shall start flashing and the hooter start sounding. When the alarm accept push button is pressed the hooter shall stop and the fascia window shall glow steady. After resetting the flags and contacts on the protective/auxiliary relay which initiated the alarm, the alarm scheme can be reset by pressing the reset push button. Now the window, which was glowing steady till then, shall go off.

12.3.4 The Trip and Non-Trip alarm annunciation scheme shall be rated for 110 V D.C. auxiliary supply.

12.3.5 The annunciation scheme shall be repetitive and shall be ready to receive and initiate systematically a second or third fault, irrespective of whether the alarm due to first or second fault in other panels is in 'initiated' or 'accepted' or 'relay reset' condition prior to fully resetting of the annunciation scheme.

12.3.6 It shall be possible to check the healthiness of fascia windows by pressing the lamp test PB.

12.3.7 Necessary interlock shall be provided to prevent closing of the circuit breaker before resetting the alarm/trip condition in that panel.

12.4.0 D.C. FAILURE CONDITION

12.4.1 For DC failure annunciation scheme instantaneously operated DC under voltage relay shall sense the DC failure and shall initiate the flag indication and the DC failure annunciation scheme. The indicating lamp comes ON and the buzzer is initiated. On pressing the 'accept' PB, the audible alarm shall stop. When DC is restored, the scheme shall get automatically reset.

12.4.2 The D.C. failure annunciation scheme shall be rated for 230 V A.C. auxiliary supply.

12.4.3 The DC failure sensing relay shall have hand reset flag indication.

12.4.4 It shall be possible to test the whole DC failure scheme. A "TEST" push button shall be provided in the sensing relay circuit to simulate DC failure and test the scheme.

13.0.0 PUSH BUTTON

13.1.0 Colour of push button knobs shall be as per relevant Indian Standard.

13.2.0 All push buttons shall be provided with legend plates to identify the function or operation.

13.3.0 All push buttons shall have minimum 1 NO + 1 NC contacts as spare, unless otherwise specified in the data sheet. Push button shall have contacts rating of 10A

14.0.0 INDICATING LAMPS

14.1.0 Indication circuit shall be through separate contacts only.

14.2.0 Indicating lamps shall be of cluster LED type.

14.3.0 All lamps shall be indigenously available and rated for 7 watts maximum. All signaling lamps must have clarity of colour.

14.4.0 Lens for signaling lamps shall be so designed to prevent glare from the bulb and it shall be of dome shape to permit visibility from all directions. The material of lens should be such that it neither gets destroyed nor changes the colour due to heat from the bulb.

15.0.0 ANTICONDENSATION HEATER

15.1.0 Two nos. of space heaters with thermostat control shall be provided in each cubicle. One each for the breaker chamber and the CT/cable chamber along with a common MCB mounted inside LT control wiring chamber.

15.2.0 Heater shall be provided inside the panel in easily accessible position for removal / replacement.

15.3.0 Wiring of space heater shall be isolated or separately bundled from other internal wiring.

16.0.0 CABLE TERMINATION & WIRING

16.1.0 CONTROL CABLE TERMINATION

16.1.1 Termination of wiring for external connection shall be done using terminals of reputed make and of proven design for long trouble free life.

16.1.2 Terminals shall be compact and shall have very high dielectric strength so as to prevent flashover and have thermal strength to prevent deterioration.

16.1.3 The moulding material of the terminal body shall preferably be melamine formaldehyde having high anti-tracking properties.

16.1.4 Identification/ numbering/ lettering shall be provided for each terminal. Such marks shall be legible even after years of service.

16.1.5 Minimum 20% spare terminals shall be provided on each terminal block.

16.1.6 Facilities shall be available for temporary or permanent short-circuiting of terminals for earthing and testing.

16.1.7 Shorting links shall be provided for all CT terminals.

16.1.8 Conductors shall be terminated with adequately sized compression type tinned copper lugs for connection to equipment terminals and strips.

16.1.9 Terminal strips shall be preferably separated from power circuits by metal barriers or enclosures.

16.1.10 All terminals shall be suitably shrouded to prevent accidental contact.

16.1.11 Sufficient clearance shall be available between terminals where terminal lugs are fitted to them.

16.1.12 Terminals shall be designed to avoid bimetallic corrosion and breaking of strands due to excess pressure.

16.1.13 Terminal strip for outgoing control cable connections shall be accessible to facilitate working and testing with breaker in test / service condition and while the switchboard is energized.

16.2.0 WIRING

16.2.1 Control and power wiring shall be kept separate.

16.2.2 All wiring for controls shall in general be carried out with copper conductor of size not less than 2.5mm^2.

16.2.3 Wiring shall be terminated in easily accessible terminal blocks.

16.2.4 The wires shall be arranged neatly and the two ends of each wire and the terminal blocks shall bear the circuit number by using unbreakable ferrules for identification purposes.

16.2.5 Control wiring wherever terminated shall be in single layer formation.

16.2.6 All inter panel control wiring shall be taken through PVC sleeves and this shall be done by the switchgear manufacturer with identification of wires and terminals for interconnection.

16.2.7 Whenever a PT is mounted in the breaker carriage, all auxiliary wiring shall be done in conduits.

16.2.8 All spare contacts of aux. relays, timers, etc. shall be wired up to the terminal block.

16.2.9 The wiring shall be of suitable grade and shall have flame resisting insulation. The insulation grade shall be 1100V / 650V min

17.0.0 INSULATION

17.1.0 The insulation between phases and between phases & ground for power or control conductors shall be made of suitable insulating material resistant to heat, dust and dampness. It shall be non-hygroscopic, mould proof and treated with suitable varnishes.

17.2.0 Minimum clearance between phases, or between connections of same phases separated electrically from each other, or between phases and ground, shall be as per relevant standards.

18.0.0 EARTHING

18.1.0 Earthing arrangement shall be in accordance with relevant Indian standards.

18.2.0 Continuous earthing strips of material and size specified in the data sheet, designed to carry the peak short circuit and short time fault current as specified shall be provided for the complete length of the switchboard. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts.

18.3.0 Earthing terminals shall be provided on the CB trucks to earth the body of the truck when pushed into the cubicle.

18.4.0 A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.

18.5.0 One of the secondary terminals of the CTs shall be earthed.

18.6.0 All doors and movable parts shall be connected to earth bus with flexible copper connection.

18.7.0 All non-current carrying metallic parts (including metallic cases of instruments and other panel mounted components) of the equipment shall be earthed.

18.8.0 Earth bus shall be extended up to each cable compartment and earthing bolts shall be provided to ground cable armours.

19.0.0 PAINTING AND LABELING

19.1.0 The sheet steel housing and all the metal surfaces shall be properly cleaned and coated with two coats of anticorrosive paint over two coats of suitable primer. A final coat in gloss finish with a colour indicated shall also be given to the switchboard.

19.2.0 All panels shall have, on the front and the rear sides, nameplates in large sized letters, giving feeder details.

19.3.0 Painted mimic diagram shall be provided on all the panels of the switchboard, unless otherwise specified in the data sheet.

19.4.0 Nameplates shall be fastened by screws and not by adhesives.

19.5.0 Special warning plates shall be provided on all removable covers or doors giving access to high voltage cables/ bus bars and inside the switchboard also wherever considered necessary.

19.6.0 Nameplates are preferred to be of white Perspex acrylic sheet with letters engraved in black.

19.7.0 A nameplate with the switchgear designation shall be fixed at the top of the central panel.

19.8.0 Bus side and cable side shutters shall be labeled for identification.

19.9.0 Nameplates shall be provided for all Door/front mounted devices such as lamps, PBs, switches, relays, aux. contactors etc., directly below them, giving the nomenclature and purpose of the device.

19.10.0 The size of the letters giving switchboard designation shall be 25 mm, for feeder details 20mm and for components 6 mm, unless otherwise specified in the data sheet.

19.11.0 Label designation and size of lettering shall be subjected to approval.

20.0.0 FOUNDATION BOLTS

20.1.0 Necessary foundation channels (if not integral), bolts and nuts shall be supplied along with the equipment, if necessary.

21.0.0 TEST CORDS AND TESTING PLUGS

21.1.0 Flexible test cord 2m long with plug and socket for testing the breakers in the withdrawn position shall be supplied in a separate case. Alternatively flexible cord used for test position shall have sufficient extra length to test the breaker in the withdrawn position also.

21.2.0 Earthing and testing plugs for cables and busbars shall be supplied in a separate box.

22.0.0 EARTHING TRUCK

22.1.0 Two numbers earthing Truck shall be supplied, unless otherwise specified in data sheet, for the switchboard. The Earthing truck shall be fully draw out pattern, complete with necessary earthing links to facilitate earthing on the cable side. Locking facility shall be available. Earthing links shall be of size to withstand the fault current specified in the single line diagram/data sheet.

22.2.0 As an alternative to the above, vendor may offer integral earthing switch in each outgoing feeder of the switchboard. Such earthing switches shall be fitted with interlocks such that circuit breakers cannot be made "ON" while earthing switch is in the 'earth position'.

22.3.0 Earthing Truck shall be provided with Audio -Visual Annunciation to prevent earthing of live cable.

23.0.0 SPARES AND SPECIAL TOOLS

23.1.0 Spare parts and special tools recommended for keeping stock for trouble free operation of CB panel for a minimum period of 2 years shall be supplied. List and catalogue numbers of these spare parts shall also be furnished.

24.0.0 DRAWINGS

24.1.0 All drawings and documents as per Vendor Data Requirement shall be furnished. The control circuits shall be prepared by the manufacturer and the drawings shall be neat, legible and incorporating all requirements. The rating of all components such as voltage, ampere and wattage/VA shall be clearly indicated in component list.

25.0.0 DEVIATION FROM SPECIFICATION

25.1.0 If the vendor wish to deviate from the provisions of the specifications, either on account of manufacturing practice or any other reasons, he shall draw attention to the proposed point of deviation in the tender and submit such full information, drawing and specification so that merits of his proposal may be fully understood. The specification shall be held binding unless the deviations have been fully accepted as requested.

1.0 GENERAL DATA

1.1	Rating details		1.12	Current transformers	
	a) Voltage	11kV ± 10%		a) Metering CT Accuracy Instrument security factor	1 5
	b) No. of phases /wires	3 phase 3 wire			
	c) Frequency	50 Hz ± 5%		b) Protection CT- Accuracy class and limit factor	5 P 20 (over current & E/F protection)
	d) Fault level (sym.)	715 MVA / 40 KA			
	e) Neutral earthing	Solid		c) Insulation Class	E
	f) Continuous rated current	Power bus 1250A	1.13	Ammeter – accuracy class	1.5
	g) Short time current, kA	Power bus 40 kA for 1 sec. CT 40kA for 1 sec. Ground bus 40KA for 3 sec.	1.14	Digital type meters	Refer cl.2.6(c)
			1.15	Push button contacts	As required
	h) Electrically exposed / non exposed	Non Exposed	1.16	Type of protection relays	Refer cl.2.7 & 2.8
	i) Loss of service continuity category	LSC 2B			
	i) Internal arc classification	IAC A FLR			
1.2	Location	Indoor	1.17	Size of indication instruments (A/m & V/m)	As per standard.
1.3	Enclosure	IP4X	1.18	a) Cable termination kits, glands etc.	Not Required. (Hardwares for cable termination shall be provided except glands lugs and termination kits)
1.4	a) Type of Circuit Breaker	Vacuum CB			
			1.19	Trip annunciation scheme	Required
1.5	Breaker closing	Motor charged spring closing	1.20	DC failure annunciation scheme	Required
1.6	DC auxiliary supply voltage	110V DC for shunt trip coil, closing coil, indication lamps, etc.	1.21	Non trip annunciation scheme	Required
			1.22	Earthing truck - Required	

					PROJECT	SUPPLY OF 11kV, 1250A, 40kA SWITCHBOARD FOR REPLACING CROMPTON & VOLTAS SWITCHBOARDS
1	07.01.2022	DVS	KPN	BKN		
0	15.10.2021	DVS	KPN	BKN	VENDOR	
REV.	DATE	PRPD.	CHKD.	APPRD		

FACT COCHIN DIVISION

1.7	AC aux supply voltage	240V AC for panel anticondensation heater and spring charging motor supply		a) Quantity	2 no.s
				b) Connection	Cable side
				c) Audio visual indication	Required
1.8	VT secondary voltage (Phase to phase)	110V	1.23	Painting	Anti-corrosive epoxy based powder coating
1.9	Bus bars-material	Insulated Aluminium	1.24	Interlocks	Scheme required
1.10	Earth bus - material	Copper rated 40 kA for 3 sec	1.25	Cable entry	Top
1.11	Mimic diagram	Required			
*	Bus bars shall be insulated with heat shrinkable sleeves rated for phase voltage and joints shall be shrouded. (Raychem / eqvt.)				

2.0 COMPONENT DETAILS-FEEDER WISE (Refer SLD)

		Incomer	Bus coupler	Dis: Feeder	Transformer	Capacitor Bank	Spare	6 MW Solar PP Incomer
2.1	**Type of feeder**							
2.2	**No. of feeders (Breakers/Cubicles)**	3	2	8	2	1	2	1
2.3	**Current Transformers with separate core for metering and protection is required**							
	a) for metering ……3…… Nos.	Reqd		Reqd	Reqd	Reqd	Reqd	Reqd
	b) for O / C & E / F protection (5P20) ..3……Nos.	Reqd		Reqd	Reqd	Reqd	Reqd	Reqd
	c) For Diff. Protection ……3…… Nos with matching CT (if required) class 5P20 or PS as per relay manufacturer's recommendation. Note: Refer class no. details of CT provided on existing 11kV panel. Vendor will have to supply the CTs for differential protection if the existing CTs are not suitable.	Reqd						
2.4	**Voltage transformers**							
	a) on cable side (Drawout Line VT)	Reqd						Reqd
	b) on busbar side	Common bus PT for each bus						
	c) Residual voltage (5 limbed PT)							
2.5	**Lamps (All Indication lamps shall be LED ,110V DC)**							
	a) Breaker ON (Red),	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	b) Breaker OFF (Green)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	c) Breaker auto trip (Amber)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	d) Breaker ready for on (Clear)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd

	e) DC failure (Blue)		Reqd					
	f) Trip alarm	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	g) Non trip alarm	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	h) Trip circuit healthy	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
2.6	**Meters**							
	a) Voltmeter (analog type) VSS for individual phase	Reqd				Reqd		Reqd
	b) Ammeter (analog type) ASS for individual phase	Reqd		Reqd	Reqd	Reqd	Reqd	Reqd
	c) Digital Multi-Function Meter (MFM) measuring current, voltage, kW, kWh, kVA, kVAR, frequency, pf etc. suitable for existing energy management system. (Conzerv EM 6400NG or equivalent model with RS 485 serial port for Modbus communication)	Reqd		Reqd	Reqd	Reqd	Reqd	Reqd
2.7	**Protection relays – composite numerical type.** A composite numerical relay with all the protections mentioned below is acceptable. If any protection mentioned below is not available in the composite relay, the same may be provided separately.							
	a) Composite numerical relay for comprehensive protection of Capacitor Bank with protection features as specified in cl. 10.3.2 of Engg Specification – HV Switchboard (13ES900/94/R1)					Reqd		
	b) O / C + E / F-51/51N + REF(for LV side) – 64R + Stand by E / F(64S) - feeder management relay.	Reqd						Reqd
	c) S / C + O / C + E / F –51,50-51/50N – transformer protection relay				Reqd			
	d) O / C + E / F -50,51,50N,51N - feeder management relay.			Reqd			Reqd	
2.8	**Protection relays – electromechanical type**							
	a) Synchro-check relay		Reqd					
	b) U/V relay	Reqd						Reqd
	c) O/V relay	Reqd						Reqd
	d) Master trip relay	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
2.9	**Aux. Relays & annunciation window**							
	a) Common trip alarm fascia (for incoming & outgoing feeders)		Reqd					
	b) Trafo. Oil level trip & alarm				Reqd			
	c) Buchholz trip & alarm				Reqd			
	d) Oil temp. Trip & alarm				Reqd			
	e) Winding temp trip & alarm				Reqd			
	f) Inter trip (HV/LV)	Reqd			Reqd			
	g) PT selection scheme		Reqd					

2.10	**Control switches and PBs**							
	a) Breaker Trip- Neutral-Close switch ODS	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	b) 3 way & OFF ammeter selector switch	Reqd		Reqd	Reqd	Reqd	Reqd	Reqd
	c) 3 way & OFF volt meter selector switch	Reqd						Reqd
	d) MCB & Thermostat for panel anti - condensation heater	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	e) MCB for Spring charging motor	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	f) PB for trip circuit healthy	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	g) Local / remote selector switch (Lockable)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	h) 2 pole switch for check synchronization relay		Reqd					
2.11	**Other items**							
	a) Breaker operation counter	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	c) Panel anti – condensation heater (strip type)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	f) Interlocks	Reqd	Reqd					Reqd
	g) Test & Service position limit switches	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	h) Breaker on time totalizer	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
2.12	**Wiring and terminals for**							
	a) Remote control trip PB	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	b) Remote control close PB	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	c) Remote ON lamp (52-1 volt free contact)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	d) Remote OFF lamp (52-2 volt free contact)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	e) Remote trip lamp (86-1 volt free contact)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	f) Remote ready for ON lamp (volt free contact)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	g) U/V relay status (volt free contact)	Reqd						Reqd
	h) Spare breaker NO & NC contacts (3No each)	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
	i) Inter trip–send & receive	Reqd			Reqd			Reqd
	k) CT leads for remote differential protection	Reqd						

3.0	**COMPONENT DETAILS – COMMON TO SWITCH BOARD**				
3.1	Relay for PT selection scheme	Reqd.	3.9	PB for reset – alarm	Reqd.
3.2	Control switch fuse / MCB for AC aux. Supply	Reqd.	3.10	PB for lamp test	Reqd.
3.3	Control switch fuse / MCB for DC aux. Supply	Reqd.	3.11	PB for DC fail alarm accept	Reqd
3.4	DC ON lamp (red) & DC failure lamp	Reqd.	3.12	PB for DC fail lamp & alarm reset	Reqd
3.5	DC fail sensing relay	Reqd.	3.13	Hooter for trip alarm	Reqd

3.6	DC fail aux. Relay	Reqd.	3.14	Buzzer for DC failure alarm	Reqd
3.7	Flasher relay	Reqd	3.15	Bell for non-trip alarm	Reqd
3.8	PB for accept – alarm	Reqd.	3.17	Wiring and termination for DC failure alarm (volt free contact)	Reqd
	Note:- " Reqd " or tick mark indicate the requirements.				
4.0	**Other Requirements**				
4.1	The breakers shall be fully withdrawable floor rolling type (Self standing type). Cassette type breakers shall not be acceptable.				
4.2	The cable compartment shall have ample space for termination kits suitable for XLPE/PVC cables of sizes specified in the data sheet and shall have facilities for support of the cables.				
4.3	Wiring terminations inside the panels shall be by crimping type lugs only.				
4.4	The connecting links to breaker from main busbars shall be rated for breaker rating and should not be degraded to CT rating of outgoing feeders.				
4.5	Indicating lamps shall be of clustered LED type				
4.6	The vendor shall provide all software and hardware required programming of numerical relays.				
4.7	All the incomer, feeders (except capacitor bank protection) & bus coupler breaker trucks shall be rated for 1250A, identical and interchangeable.				
4.8	One no identical and interchangeable spare VCB including the truck and all accessories shall be supplied for the capacitor bank, rated for 1250A.				
4.9	Max. operating height of relays, MFM, etc shall be limited to 2m from floor level.				
4.10	Separate transparent peep hole shall be permitted for cable termination chamber for viewing cable termination.				
4.11	Connection to breaker from main busbar shall be rated for 1250A irrespective of CT rating and outgoing feeder connection from breaker shall be rated for 1250A.				

5.0 Feeder Details

Panel No.	Name	Breaker Rating(A)	VCB class	CT ratio Metering	CT ratio Protection	Numerical Protection Relay	Power cable
1	SPARE	1250	E2,M2	800/5	800/5	Reqd.	XLPE, 4 nos, 3C x 400sqmm
2	UTILITY-1	1250	E2,M2	150/5	150/5	Reqd.	XLPE, 1 no, 3C x 300sqmm
3	INCOMER-1	1250	E2,M2	1250/5	1250/5 (5P20), 1250/0.578 (PS)	Reqd.	XLPE, 5 nos, 3C x 400sqmm
4	CSS FDR-1	1250	E2,M2	1250/5	1250/5	Reqd.	XLPE, 5 nos, 3C x 400sqmm
5	NPK-1	1250	E2,M2	800/5	800/5	Reqd.	XLPE, 4 nos, 3C x 400sqmm
6	6 MW SOLAR PP INCOMER	1250	E2,M2	600/5	600/5	Reqd.	-
7	ST. TRF-1	1250	E2,M2	75/5	75/5	Reqd.	XLPE, 1 no, 3C x 240sqmm
8	CAPACITOR BANK 1000kVAR	1250	C2,M2	75/5	75/5	Reqd.	XLPE, 1 no, 3C x 240sqmm
9	LAKE VIEW S/S	1250	E2,M2	1250/5	1250/5	Reqd.	XLPE, 5 nos, 3C x 400sqmm
10	BUS COUPLER-1	1250	E2,M2	-	-	Reqd.	-
11	INCOMER-2	1250	E2,M2	1000/5	1000/5 (5P20), 1000/1 (PS)	Reqd.	XLPE, 5 nos, 3C x 400sqmm
12	BUS COUPLER-2	1250	E2,M2	-	-	Reqd.	-
13	CSS FDR-2	1250	E2,M2	1250/5	1250/5	Reqd.	XLPE, 5 nos, 3C x 400sqmm
14	NPK-2	1250	E2,M2	800/5	800/5	Reqd.	XLPE, 4 nos, 3C x 400sqmm
15	ST. TRF-2	1250	E2,M2	75/5	75/5	Reqd.	XLPE, 1 no, 3C x 240sqmm
16	INCOMER-3	1250	E2,M2	1000/5	1000/5 (5P20), 1000/1 (PS)	Reqd.	XLPE, 5 nos, 3C x 400sqmm
17	RPH S/S	1250	E2,M2	1250/5	1250/5	Reqd.	XLPE, 5 nos, 3C x 400sqmm
18	UTILITY-2	1250	E2,M2	150/5	150/5	Reqd.	XLPE, 1 no, 3C x 300sqmm
19	SPARE	1250	E2,M2	800/5	800/5	Reqd.	XLPE, 4 nos, 3C x 400sqmm

1.0	CIRCUIT BREAKER	
1.1	Make	
1.2	Country of manufacture	
1.3	Type of reference	
1.4	Type of circuit breaker (VCB/SF6 etc.)	
1.5	Conformity to standards	
1.6	Rated voltage	
1.7	Maximum permissible operating voltage	
1.8	Rated current	
1.9	Rated frequency	
1.10	Number of poles	
1.11	Rated insulation level – (a) Indoor (b) Outdoor	
1.12	Rated line charging breaking current	
1.13	Rated cable charging breaking current	
1.14	Rated capacitor breaking current	
1.15	Rated small inductive breaking current	
1.16	Rated symmetrical short circuit breaking capacity	……..KA / …….MVA
1.17	Rated asymmetrical short circuit	
1.18	Rated transient recovery voltage	
1.19	Rated making current (KA peak)	
1.20	Rated short time current - (a) 1 Sec. (b) 3 Sec.	
1.21	Rated duty cycle	
1.22	Opening time	
1.23	Arc duration	
1.24	Total break time at rated S.C capacity	
1.25	Closing time	
1.26	No. of breaks per phase	
1.27	Total length of break per phase	
1.28	Type of main contact	
1.29	Type of arcing contact	
1.30	No. of aux. Contacts (NO+NC) (Without multiplying contactor)	

1.31	Method of power closing offered	
1.32	Whether manual closing & tripping facility is available, in addition to the power closing & tripping	
1.33	Whether this extra manual closing be used for switching	
1.34	Whether the circuit breaker is fitted with fixed trip or trip free mechanism	
1.35	Whether contact touches and part when CB tried to close with tripping impulse prevailing or do not touch at all	
1.36	Normal voltage of the spring charging motor	
1.37	Power at normal voltage required for spring charging motor	
1.38	Time taken to charge the spring completely by the motor	
1.39	Normal and minimum operating voltage of closing mechanism	
1.40	Power at normal voltage required for closing coil	
1.41	Normal and minimum voltage required for trip coil	
1.42	Power at normal voltage required for trip coil	
1.43	Whether antipumping relays and circuitry provided along with operating mechanism	
1.44	Short circuit type test certificate No. or report No.	
1.45	Short circuit type test certificate or report enclosed	
2.0	**BUS BARS**	
2.1	Conformity to standards	
2.2	Material & grade of bus bars	
2.3	Bus bars PVC covered or not	
2.4	Type of covering	
2.5	Continuous current rating	
2.6	Whether the size of bus bars is same throughout switchboard	
2.7	Size of bus bars – Horizontal Vertical	
2.8	Colour coding	
2.9	Type of insulation	

2.10	Type of insulation at joints / tap-offs	
2.11	Derating factor applied in view of PVC covering	
2.12	Peak dynamic withstand capacity	
2.13	Details of bus bar supports	
2.14	Rated short time current for 1 second	
2.15	Rated short time current for 3 second	
2.16	Guaranteed temp. rise at rated current for bare bus bars	
2.17	Guaranteed temp. rise at rated current for PVC bus bars	
2.18	Whether short circuit type test certificates attached or not	
2.19	Provision for future extension	
2.20	Clearance of bus bars in air	
	a) Phase to phase	
	b) Phase to earth	
3.0	**CURRENT TRANSFORMERS**	
3.1	Conformity to standards	
3.2	Make	
3.3	Whether bar primary / wound	
3.4	VA capacity	
3.5	Insulation class	
3.6	Epoxy resin cast or other type with details	
3.7	Whether dual purpose CTs proposed contrary to the specification requirement	
3.8	Class accuracy for O/C & E/F protection	
3.9	Class accuracy for metering	
3.10	Class accuracy for special protection	
3.11	Short time current rating	
3.12	Duration of rated short time current	
3.13	Short circuit type test certificate attached or not	
3.14	Accuracy limit factor for protection class CTs	
3.15	Instrument security factor for metering CTs	
3.16	Guaranteed temp. rise at rated current	
4.0	**VOLTAGE TRANSFORMERS**	
4.1	Conformity to standards	
4.2	Type – Oil immersed / resin cast?	
4.3	VA capacity	
4.4	Withdrawable or not	

4.5	Connection	
4.6	Class of accuracy	
4.7	VTs connected to cable side or bus bar side	
4.8	Mounted on top of switchboard or in separate PT panel or in CB truck?	
5.0	**RELAYS**	
5.1	**ELECTROMECHANICAL**	
	a) Conformity to standards	
	b) Make	
	c) Withdrawal features provided or not	
	d) Contact - Hand reset / self reset?	
	e) Whether hand reset flags available?	
	f) Mounting – Flush / Projection	
	g) Attach catalogues of different types of relays with details of VA consumption, operating data, Contact arrangement etc.	
5.2	**NUMERICAL PROTECTION RELAYS**	
	a) Conformity to standards	
	b) Make	
	c) Model	
	d) Tripping curve as per IEC standard or not	
	e) Withdrawal features provided or not	
	f) Mounting – Flush / Projection	
	g) Attach catalogues of different types of relays with details of VA consumption, operating data, Contact arrangement, communication details, Programming software etc.	
6.0	**METERS**	
6.1	Conformity to standards	
6.2	Make	
6.3	Type	
6.4	Mounting: flush / projection	
6.5	Size of meters	
6.6	Scale size	
6.7	Class of accuracy	
6.8	VA consumption of different meters	
7.0	**INDICATION LAMPS**	
7.1	Conformity to standards	
7.2	Make	
7.3	Type	

7.4	Watts rating at specified auxiliary voltage	
8.0	**PARTICULARS OF THE EQUIPMENT**	
8.1	Area of cross section of conductor between bus bars and circuit breaker of each rating.	
8.2	Material and voltage class (grade) of insulation of above conductors, if insulated	
8.3	Size & material of earth bus bar	
8.4	Thickness of panel doors (mm)	
8.5	Thickness of load bearing members (mm)	
8.6	Thickness of base frame (mm)	
8.7	Loss of service continuity category	
8.8	Internal arc classification	
8.9	Weight of CB truck complete with all accessories (Kg)	
8.10	Weight of switchgear complete with CB trucks(Kg)	
8.11	Weight of each S/B (kg) (Dynamic loading, if any, shall be furnished)	
8.12	Shipping weight of the largest consignment and size	
8.13	Size of each panel / W x D x H	
8.14	Minimum distance required on the front side for withdrawal of circuit breaker	
8.15	Whether the equipment dust, damp and vermin proof	
8.16	Details of steps taken to render equipment dust, damp and vermin proof	
8.17	Details of anti corrosive treatment to make eqpt. suitable for the environment	
8.18	Technical details / catalogues / /leaflets & type test certificate of components / items enclosed	
8.19	Details of earthing truck	
8.20	Ingress Protection rating of enclosure	
8.21	Rating details & technical particulars of HV fuses (if any)	

Sl. No.	Description	Quantity	Unit Price	Total Price
1.0	**HV SWITCHBOARD SPARES**			
1.1	Breaker Pole	3 nos		
1.2	Control fuse / PT secondary fuse (of each rating)	4 nos		
1.3	Breaker control switch	2 nos.		
1.4	Closing coil	2 nos.		
1.5	Tripping coil	2 nos.		
1.6	Closing spring	1 no.		
1.7	Tripping spring	1 no.		
1.8	Spring charging motor	1 no.		
1.9	Bus support insulator (each type)	2 nos.		
1.10	11kV PT fuse	2 nos.		
1.11	LED Indication lamps (each type)	2 nos.		
1.12	Composite numerical protection relays (each type)	1 no.		
1.13	Surge arrester for VCB (required only if supplied along with original equipment)	2 nos.		
1.14	Selector switches (each type)	2 nos.		
1.15	One no identical and interchangeable spare VCB including the truck and all accessories shall be supplied for the capacitor bank, rated for 1250A.	1 no		

	VCB PANEL SIEMENS SCHNEIDER ELECTRIC ABB L & T CROMPTON JYOTI **PROTECTIVE RELAYS (NUMERICAL)** ALSTOM/AREVA ABB SIEMENS SCHNEIDER ELECTRIC GE L & T CROMPTON **INSTRUMENT TRANSFORMERS** AUTOMATIC ELECTRIC PRAGATHI SILKANS SIEMENS ALSTOM /AREVA ABB ECS INTRANS KAPPA SCHNEIDER ELECTRIC NB: Panel manufactures have a freedom to use their own national / international accredited agencies certified components in switch boards.		

REV. NO.	DATE	DESCRIPTION	PRPD	CHKD	APPRD
3					
2					
1	07.01.2022		DVS	KPN	BKN
0	15.10.2021	-	DVS	KPN	BKN

FACT CD

TPS No. CD-110SS-11kV-SB

We here by state that our Quotation No…….. is in full compliance with the documents issued against the Enquiry No. …….. except for the deviations listed below.

LIST OF DEVIATIONS

S. No.	Description	Reasons for Deviation

Name of Vendor:

Date: Name & Designation Seal & Signature

FACT CD

	PRICE FORMAT	CD-110SS-11kV-PB	
		Page 1 of 1	R1

Sl. No.	Description	Quantity	Unit price	Total price
1.0	Design, engineering, manufacturing, testing at works and supply of 11kV, 1250A, 40kA Vacuum Circuit Breaker switchboard for 110kV substation conforming to attached specifications/documents.	1 No		
2.0	Supply of spares for items 1.0	1 set		
3.0	Arranging inspection and tests as per “Scope of Inspection & Tests” attached.	1 set		
4.0	Commissioning of switch board, Including programming, setting, etc. of numerical relays (Erection of switch board shall be arranged by purchaser through separate contract).	1 set		

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
1	11kV, 1250A, 40kA switchboard with Vacuum circuit breaker as per following details	1 No.		Complied/ Not Complied	
2	VCB switchboard shall meet all standards specified in the Engineering Specification (Tag No. 13ES900/94/R1 & 13ES903/94/R1).			Complied/ Not Complied	
3	The switchboard shall comply loss of service continuity category of LSC 2B and internal arc classification IAC A FLR. Type test reports for the same shall be submitted.			Complied/ Not Complied	
4	Degree of protection shall not be less than IP 4X.			Complied/ Not Complied	
5	The load bearing components of switchboard shall be of min. 2mm thick folded sheet steel construction.			Complied/ Not Complied	
6	Removable gland plates are required in rear top plate of cable compartment.			Complied/ Not Complied	
7	Switchgear shall be suitable for top entry of the cable.			Complied/ Not Complied	
8	Max. operating height of relays, MFM, etc shall be limited to 2m from floor level.			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
9	Type of breaker-Vacuum circuit breaker, three pole, horizontal draw out, horizontal isolation and floor roll-out type.			Complied/ Not Complied	
10	The breakers shall be E2/C2, M2 class type tested.			Complied/ Not Complied	
11	Rated operating duty shall normally be O-3sec-CO-3min-CO.			Complied/ Not Complied	
12	Total break time shall be Less than 75ms.			Complied/ Not Complied	
13	Breakers of same ratings shall be interchangeable. Wiring and termination of plug-in contacts shall be identical in all interchangeable breakers.			Complied/ Not Complied	
14	Breaker isolating contacts shall be self-aligning type.			Complied/ Not Complied	
15	Auxiliary contacts continuous rating shall be 10A at 230V AC.			Complied/ Not Complied	
16	The breaker operating mechanism shall be quick make, quick break type and trip-free as per relevant code of practice.			Complied/ Not Complied	
17	Electrically operated motor charged spring closing mechanism shall be used in the breaker with provision for manual charging through handle. Necessary operating handles shall be supplied.			Complied/ Not Complied	
18	The closing solenoids / coils and auxiliary devices shall operate satisfactorily between 85 and 110% of the rated auxiliary supply voltage indicated in the data sheet.			Complied/ Not Complied	
19	Trip coils shall operate satisfactorily at all voltages between 70% and 110% of the rated auxiliary voltage.			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
20	Irrespective of the mode of operation of the breaker, independent manual closing and tripping arrangements shall be provided as a standard feature for emergency and testing purpose.			Complied/ Not Complied	
21	Anti-pumping relay & circuitry/anti pumping feature shall be provided in the closing circuit of the CB to ensure that it does not re-close automatically after a tripping or in the case of failure to close, even if the closing impulse is maintained.			Complied/ Not Complied	
22	All circuit breakers shall have mechanical ON/OFF indicator and spring charge indicator which shall be visible from the front without opening the panel door.			Complied/ Not Complied	
23	Provision for mechanical (manual) tripping of breaker and manual charging of the springs shall be provided.			Complied/ Not Complied	
24	It shall not be possible to close the circuit breaker unless it is fully plugged in (truck in service position) or fully isolated (truck in the test position) or has been completely removed from the cubicle			Complied/ Not Complied	
25	It shall not be possible to discharge the closing spring if the CB is in closed position already			Complied/ Not Complied	
26	It shall not be possible to close the circuit breaker unless the closing spring is fully charged			Complied/ Not Complied	
27	Interlock shall be provided to prevent pushing in /drawing out of the breaker truck from any of the above positions to another when the breaker is in the closed position			Complied/ Not Complied	
28	Truck shall not be racked into service position with door open and control connection disengaged. Insertion of breaker into `Service' position shall not be possible if safety shutters are not free. Door interlock shall have defeat feature			Complied/ Not Complied	
29	Padlocking facility in test & service position shall be made available			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
30	Mechanical (Castell key interlock) and electrical interlocks shall be provided for Incomers and bus coupler Circuit Breakers for preventing parallel operation of the incomers. Keys shall be trapped in circuit breaker "CLOSED" condition and free in circuit breaker "OPEN" condition.			Complied/ Not Complied	
31	Safety Shutters having locking facility in the closed position shall be provided in CB receiving compartment. Busbar / cable marking on safety shutters shall be provided.			Complied/ Not Complied	
32	Bus bars material shall be of high conductivity aluminium / copper as specified in the data sheet. Bus bars shall be continuously rated for the rated current and service conditions specified.			Complied/ Not Complied	
33	Bus bars shall be provided with heat shrinkable, non-tracking, low absorption type PVC insulated sleeves of rated voltage insulation of the switchboard			Complied/ Not Complied	
34	Busbar joints and tap-offs shall be shrouded with removable shrouds of rated voltage insulation			Complied/ Not Complied	
35	Maximum allowable current density shall be 1.25A/mm^2 for copper conductor and 0.78A/mm^2 for aluminium conductor.			Complied/ Not Complied	
36	The horizontal and vertical bus bars shall be rated for the same fault level specified in the data sheet			Complied/ Not Complied	
37	The busbar supports shall be non-hygroscopic epoxy resin material (or glass reinforced plastic) with anti-tracking features to prevent flashovers. These shall have high tracking index and be mechanically strong. Hylam shall not be acceptable.			Complied/ Not Complied	
38	It shall be possible to extend the bus bars on either side without any further fabrication / modification on the existing bus bars. Removable end covers with fixed nut and bolting arrangement shall be provided on either end and the ends of the bus bars shall be suitably drilled.			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
39	CTs shall withstand the maximum short circuit current for a minimum of one second and it shall be designed to withstand stresses resulting from the maximum short circuit currents.			Complied/ Not Complied	
40	CTs for metering and protection shall be selected suitably to meet the individual requirements of meters and relays specified in the data sheet. Low reactance CTs shall be used for protection.			Complied/ Not Complied	
41	CTs for metering shall have adequate capacity to cater for 130% of full load conditions.			Complied/ Not Complied	
42	Instrument security factor for metering CTs shall not be more than 5 and shall have an accuracy class of 1, unless otherwise specified.			Complied/ Not Complied	
43	CTs for protection purposes shall have sufficient accuracy, burden and accuracy limit factor for necessary coordination / discrimination for clearing the faults. Accuracy limit factor for protection shall not be less than 20 and accuracy class shall be 5P.			Complied/ Not Complied	
44	CTs shall have class E insulation.			Complied/ Not Complied	
45	The actual burden of the CTs shall meet the requirements of relays, instruments and leads associated with the particular CT including 20% spare capacity. Details shall be furnished during the time of detailed engineering.			Complied/ Not Complied	
46	Separate CTs / cores shall be used for metering and protection. Dual purposes CTs shall not be acceptable.			Complied/ Not Complied	
47	CTs shall be provided with polarity markings adjacent to terminals, both for primary and secondary. These shall be legible even after years of service.			Complied/ Not Complied	
48	CTs shall have solidly earthed system			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
49	PTs shall have suitable accuracy and capacity for the satisfactory operation of the protection, instrumentation and metering specified in the data sheet / drawings enclosed. The class of accuracy and the burden on PTs selected shall be adequate for the destined different purposes.			Complied/ Not Complied	
50	Potential transformer shall be 'fully draw out' type			Complied/ Not Complied	
51	Potential transformer shall be provided with HRC fuses on both HV and LV sides. The draw out mechanism shall disconnect the bus bars and the primary connection shall be disconnected before the PT or its primary fuses become accessible. PT mounted inside cable chamber shall not be acceptable.			Complied/ Not Complied	
52	The primary rated voltage shall be equal to the rated voltage of the system and unless otherwise specified, secondary voltage shall be 110V.			Complied/ Not Complied	
54	PTs shall have class E insulation.			Complied/ Not Complied	
55	PTs shall have solidly earthed system			Complied/ Not Complied	
56	PT selection scheme shall be provided in the bus coupler panel. PT voltage supply to the bus sections shall be fed from the respective incomer's PT secondary in normal conditions.			Complied/ Not Complied	
57	Numerical protection relays shall have control, measurement and supervision facility.			Complied/ Not Complied	
58	Numerical relays shall be back connected, draw out / plug-in type suitable for flush mounting and fitted with dust tight covers.			Complied/ Not Complied	
59	Protection relays shall be compatible with protection CT secondary current of 1A/5A as indicated in the data sheet.			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
60	Protection relays shall be suitable for auxiliary (control) power supply of 110V DC with 90-110% variation.			Complied/ Not Complied	
61	Protection relays voltage input (PT input) - 110 volt A.C. supply, obtained from PT selection scheme			Complied/ Not Complied	
62	Protection relays shall conform to the latest edition of IS: 3231/IEC 60255 or to relevant Indian / International standards.			Complied/ Not Complied	
63	The IDMT characteristic of the protection relays shall follow tripping curves of IEC standard.			Complied/ Not Complied	
64	Numerical relays shall have self-monitoring facility and it shall have relay healthy/relay in operation indication on the fascia.			Complied/ Not Complied	
65	Numerical relays shall have minimum of 2 numbers of programmable binary inputs and programmable binary outputs. It shall also have oscillography record and event recorder of minimum 10 events.			Complied/ Not Complied	
66	Protection relays shall be compatible for solidly grounded networks.			Complied/ Not Complied	
67	Numerical relays shall support both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol together with the DNP3, IEC 60870-5-103, Ethernet IEC-61850 and Modbus protocols. Numerical relays shall have Ethernet connectivity with necessary software for PC interface and programming. They shall have RS485/Ethernet/USB communication ports for interfacing with relay.			Complied/ Not Complied	
68	Numerical relay shall have LCD/LED display unit, keypads, LED indicators and communication port for parameter setting, monitoring and controlling the protection relay			Complied/ Not Complied	

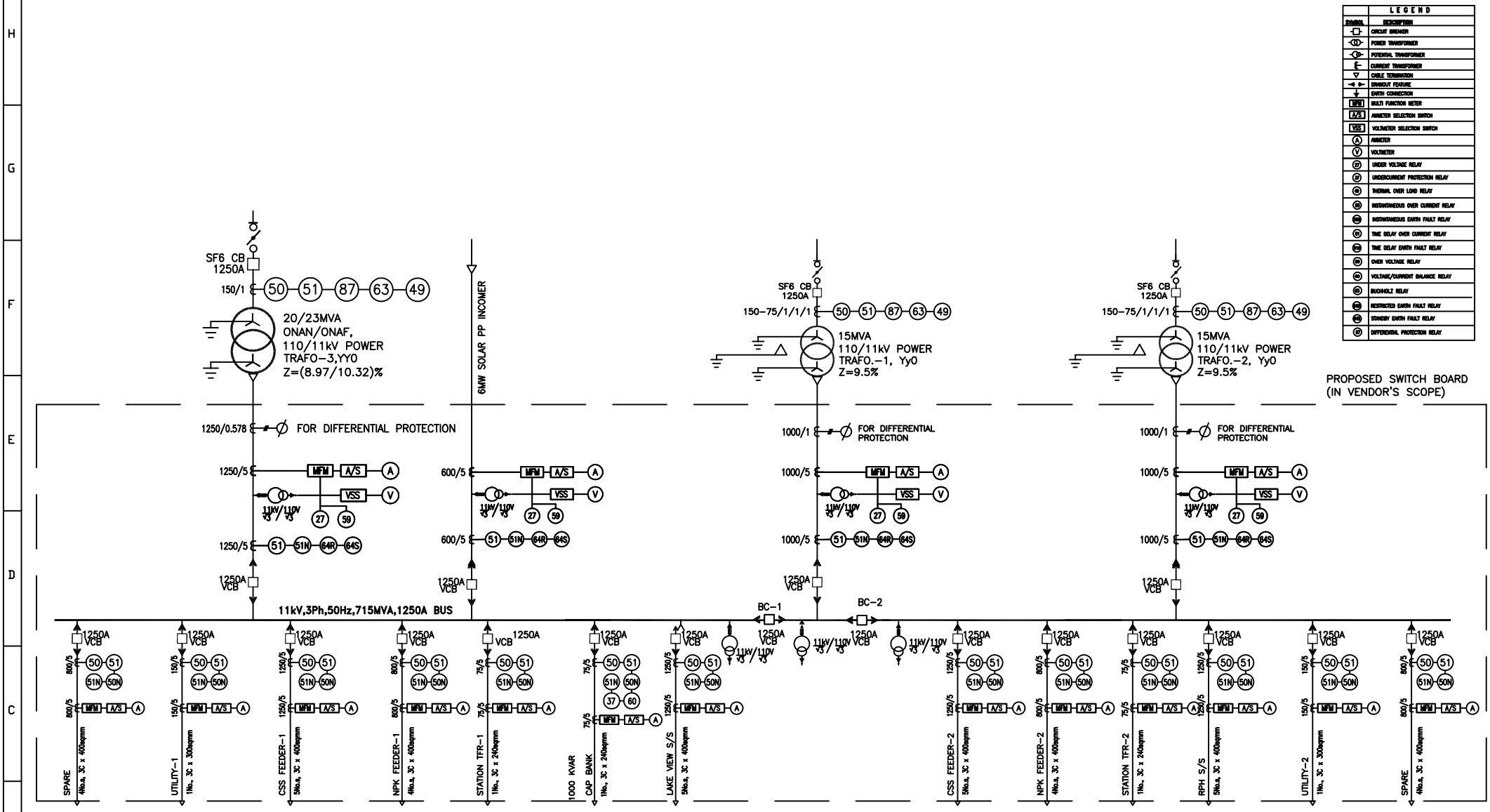
Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
69	Numerical protection relays shall have adequate push buttons on the fascia to display and edit the relay settings, to display and activate the control segment of the relay, to display the relay's instrumentation and fault data and to reset the output relays and LEDs.			Complied/ Not Complied	
70	--				
71	The vendor shall supply software of numerical relay, compatible with MS Windows (XP SP2, Win7-32bit or Win7-64bit) and provide configuration support during the erection and commissioning of the switchboard. Relay technical catalogue, operation manuals, brochures etc. shall be supplied in both hard and soft copies.			Complied/ Not Complied	
73	The numerical feeder protection relay shall be designed for the main protection of medium voltage feeders and main protection for underground cable feeders in distribution networks. The numerical transformer protection relay shall be designed for the main protection of low power transformers (less than 10 MVA). Both the relays shall be compatible for solidly grounded networks.			Complied/ Not Complied	
74	Numerical feeder protection relay shall have all protections specified in Engineering Specification (13ES903/94/R1), Clause 10.2.2			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
79	All auxiliary relays have minimum 2 potential free contacts as spare			Complied/ Not Complied	
80	Microprocessor based Electronic Multi-Function Meter (MFM) with load survey facility and RS 485 communication port with necessary software / hardware for connectivity to PLC/DCS/SCADA using Modbus RTU communications (Parameters A, V, KW, KWH, KVA, KVAR, PF, THD of voltage & current) supplied as specified in data sheet.			Complied/ Not Complied	
81	MFM meter front panel shall have LED display.			Complied/ Not Complied	
82	The displayed readings shall be updated in every second.			Complied/ Not Complied	
83	Meter shall be configurable for 5 A or 1 A secondary CTs			Complied/ Not Complied	
84	The meter shall have accuracy class 0.2 or better.			Complied/ Not Complied	
85	MFM meters shall be configurable & programmable through the front panel.			Complied/ Not Complied	
86	Separate visual and audible annunciation scheme shall be available for Trip (automatic tripping on fault conditions) , Non-Trip alarm & D.C. failure conditions			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
87	It shall be possible to check the healthiness of fascia windows and DC failure indication lamp by pressing the respective lamp test PB			Complied/ Not Complied	
88	All protection relays trip and alarm contacts shall be wired to the Trip and Non-Trip alarm annunciation scheme			Complied/ Not Complied	
89	An annunciation panel as specified in clause 12.3.2 of the engineering specification (13ES903/94/R1) shall be provided on the bus coupler panel			Complied/ Not Complied	
90	The Trip and Non-Trip alarm annunciation scheme shall be rated for 110 V D.C. auxiliary supply			Complied/ Not Complied	
91	The annunciation scheme shall be repetitive and shall be ready to receive and initiate systematically a second or third fault, irrespective of whether the alarm due to first or second fault in other panels is in 'initiated' or 'accepted' or 'relay reset' condition prior to fully resetting of the annunciation scheme.			Complied/ Not Complied	
92	Instantaneously operated DC under voltage relay provided in bus coupler panel. For DC failure annunciation scheme instantaneously operated DC under voltage relay shall sense the DC failure and shall initiate the flag indication and the DC failure annunciation scheme. The indicating lamp comes ON and the buzzer is initiated. On pressing the 'accept' PB, the audible alarm shall stop. When DC is restored, the scheme shall get automatically reset.			Complied/ Not Complied	
93	The D.C. failure annunciation scheme shall be rated for 230 V A.C. auxiliary supply.			Complied/ Not Complied	
94	All push buttons shall have minimum 1 NO + 1 NC contacts as spare, unless otherwise specified in the data sheet. Push button shall have contacts rating of 10A.			Complied/ Not Complied	
95	Indicating lamps shall be of cluster LED type			Complied/ Not Complied	

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
96	Two nos. of space heaters with thermostat control shall be provided in each cubicle, one each for the breaker chamber and the CT/cable chamber along with a common MCB mounted inside LT control wiring chamber.			Complied/ Not Complied	
97	Identification/ numbering/ lettering shall be provided for each terminal. Such marks shall be legible even after years of service.			Complied/ Not Complied	
98	All terminals shall be suitably shrouded to prevent accidental contact.			Complied/ Not Complied	
99	All wiring for controls shall in general be carried out with copper conductor of size not less than $2.5mm^2$.			Complied/ Not Complied	
100	The wires shall be arranged neatly and the two ends of each wire and the terminal blocks shall bear the circuit number by using unbreakable ferrules for identification purposes.			Complied/ Not Complied	
101	The insulation between phases and between phases & ground for power or control conductors shall be made of suitable insulating material resistant to heat, dust and dampness. It shall be non-hygroscopic, mould proof and treated with suitable varnishes.			Complied/ Not Complied	
102	Continuous earthing strips of material and size specified in the data sheet, designed to carry the peak short circuit and short time fault current as specified shall be provided for the complete length of the switchboard. Strips shall be connected to the body of the switchboard by means of integral bolts, spring washers and nuts.			Complied/ Not Complied	
103	A minimum of 2 terminals shall be provided on the strip for external connections to earth grid.			Complied/ Not Complied	
104	All doors and movable parts shall be connected to earth bus with flexible copper connection.				

Sl. No.	FACT's Requirements	Quantity		Bidder's Confirmation (Strike off whichever is not applicable)	Details/ Remarks/ Deviation if any
		Required	Offered		
105	All non-current carrying metallic parts (including metallic cases of instruments and other panel mounted components) of the equipment shall be earthed.			Complied/ Not Complied	
107	The sheet steel housing and all the metal surfaces shall be properly cleaned and coated with two coats of anticorrosive paint over two coats of suitable primer. A final coat in gloss finish with a colour indicated shall also be given to the switchboard.			Complied/ Not Complied	
108	Painted mimic diagram shall be provided on all the panels of the switchboard, unless otherwise specified in the data sheet.			Complied/ Not Complied	
109	Earthing and testing plugs for cables and busbars shall be supplied in a separate box.			Complied/ Not Complied	
110	Spare parts and special tools recommended for keeping stock for trouble free operation of CB panel for a minimum period of 2 years shall be supplied. List and catalogue numbers of these spare parts shall also be furnished.			Complied/ Not Complied	



NOTES

ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED

SL.NO.	ZONE	PARTICULARS	INITIAL
		REVISIONS	

DESIGNED	DPK
DRAWN	ABHIJITH
CHECKED	PARAMESWARAN
APPROVED	BINDHUKALA
DATE	22.03.2022
SCALE	NTS

THE FERTILISERS AND CHEMICALS TRAVANCORE LTD.
COCHIN DIVISION
AMBALAMEDU KERALA

TITLE

PROPOSED 11KV VCB SWTITCHBOARD FOR FACT-CD

SHEET NO.

DRG No: CD-ELE-110KVSS-11KVSB-R1